Classroom Computer News

MAY-JUNE, 1981 VOLUME 1, NO. 5 $3.00

What's Holding Back Computer Use in Education?

by Dan Isaacson

Detroit 1903—Henry Ford announces production breakthrough. One million Model T's to be produced this year. Will cost consumer $100 each.

Washington, D.C. 1904—Federal agency hearings today on why 900,000 Model T's are still in dealer showrooms. Dealers concerned.

Washington, D.C. 1904—American Automobile Association responds: In today's hearings, the AAA made the following points: (1) Ford's new technology dumped too many cars on the market before drivers were trained to drive them; (2) drivers could not be taught because there were too few trained driving instructors; (3) having an automobile is very exciting, but gas stations are too far apart—drivers run out of gas between stations; (4) building more gas stations would be useless since refined petroleum supplies are too low; (5) even if we started today, we'd need five to 10 years to design and build enough oil refineries to supply the demand; (6) not enough chemical engineers are trained to design and build the needed refineries; (7) the public is apathetic about this new technology since life has existed for at least 4000 years without it. The public believes it is too complicated and cumbersome to be more than a temporary fad.

Every seven years, the cost of computer power goes down by a factor of ten. Some claim that if the automobile industry had been able to develop its technology at the rate the computer

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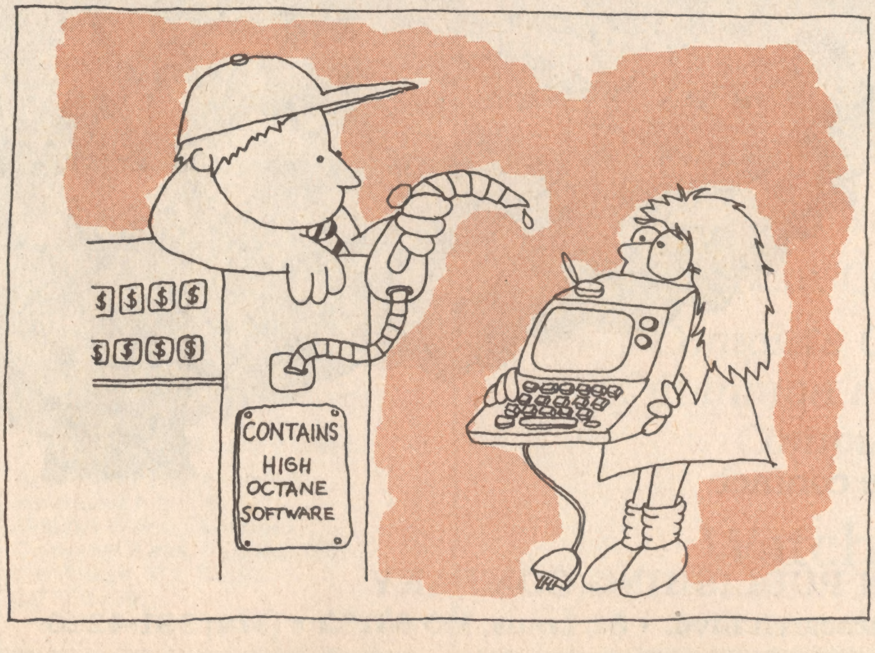

Steve Lynch

MICRONEWS

- By the 1990s, educational computing will be a distinct market requiring models geared to each student level, predicts Nigel Searle of Sinclair Research Ltd. Searle, whose firm produces a pocket computer, says that the next decade's students will practice multiplication by talking into a computer the size of a credit card.

- Elementary schools can now earn TRS-80 computers as premiums from magazine subscription sales, due to a recent agreement between QSP, Inc., a Readers Digest Association subsidiary, and Radio Shack. To find out how to get the new technology by selling the old, contact William E. Drake, QSP, Inc., Box 2003, Ridgefield, CT 06877.

- A new, low-cost personal computer will makes its debut at the May National Computer Conference. The Osborne I, produced by the newly formed Osborne Computer Corporation, reportedly includes such features as disk drives and word-processing software. Adam Osborne, known for his books and articles on the microcomputer industry, founded the corporation.

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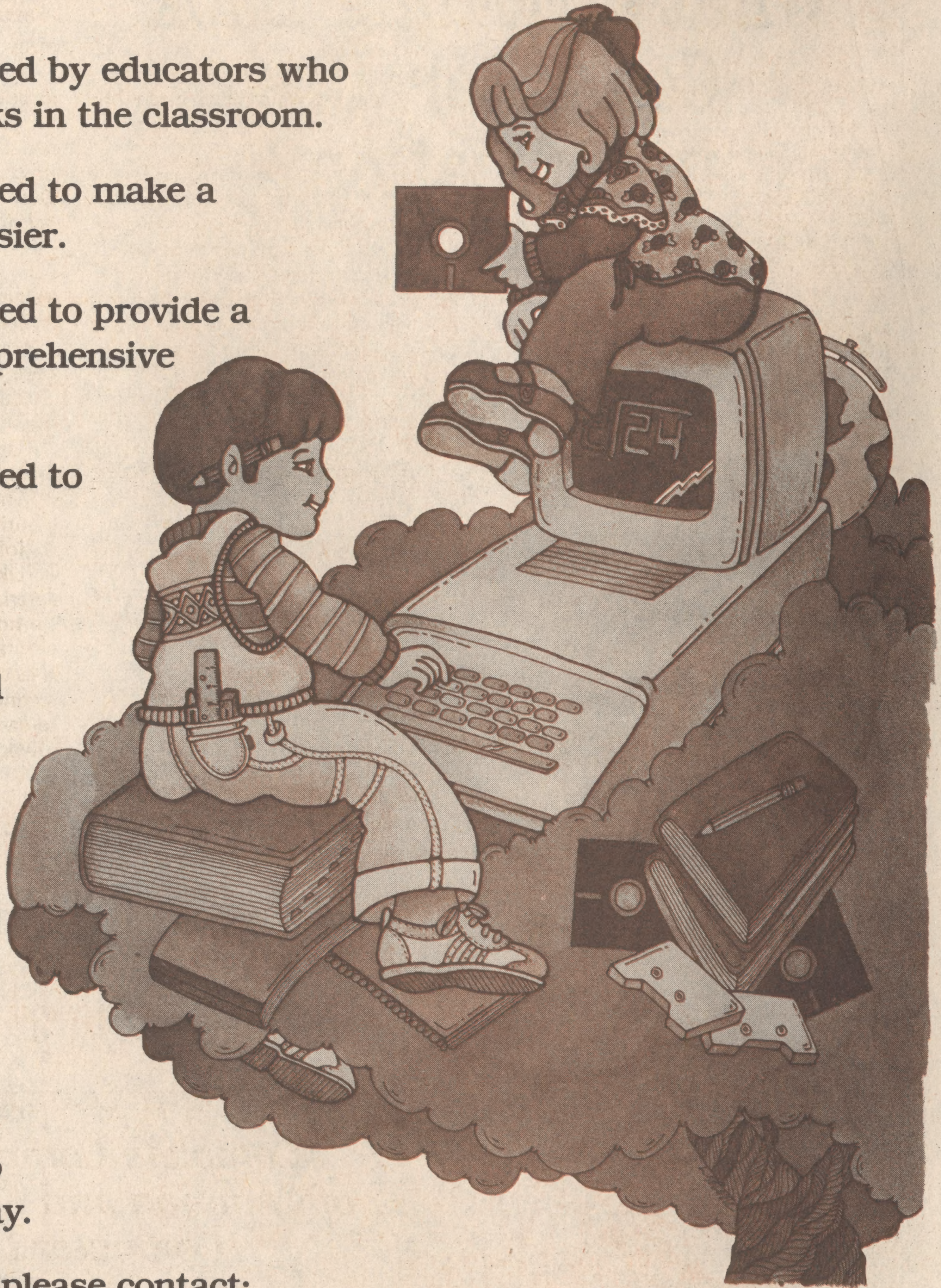

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FORUM

Sharing Resources

by Lloyd R. Prentice

It was only the second week into the class, but clearly they were distraught. "It's an hour drive into the University," the teacher said.

"We work during the day and take classes at night so we can't get in to work with the machines in the lab," the librarian added.

"But it's open on Saturdays," I offered.

"That's when we do our laundry," the teacher responded. "Can't you give us regular class time to work in the lab?"

Too many students and not enough machines and too much ground to cover and not enough hours. I was beginning to regret my long harangue about the iron-clad necessity of spending at least two hours a week playing with a computer outside formal class hours. It was the end of a twelve-hour day and I'd not yet had my supper.

"So what're we going to do," they cried in unison. "We'll never learn anything if we can't get our hands on a machine!"

With that we were silent for a time and then I had an inspiration.

"There must be a microcomputer somewhere in your system. See if you can take it home on weekends—"

They lit up simultaneously and made moves to embrace me, but I edged away, feeling that I'd more than earned my dinner.

The next week they pounced on me as I entered the classroom. They looked like the bereaved at a funeral.

"The high school has the only computer in our system," the teacher said.

"It's under the thumb of the math chairman," the librarian added.

"And he won't let it out of the math department," I deduced, remembering my days at the big university trying to gain access to a terminal in the hallowed halls of the computation center.

"Maybe you can find a computer store in your area that'll let you work on a demonstration model between customers," I threw out half-heartedly.

By the next meeting their distress had clearly given way to elation.

"You found a machine!" I greeted them.

"We've decided to chip in and buy one together," the teacher said.

"She'll use it on weekends and I get it during the week," the librarian added.

"Joint custody," the teacher smiled.

"Like getting married again," the librarian laughed. "Til death do us part—"

I nodded, thinking that we've got a way to go before the microcomputer lives up to its promise as a truly personal technology. Were acquiring a computer so easy for the many youngsters deprived of access.

Coming July/August

The First Annual
Classroom Computer News
Complete Compendium
of Common and Uncommon
Computer Lore

Watch For It!

DOE Surveys School District Computer Use

Approximately one of every four public schools (about 22,000) currently has at least one microcomputer or computer terminal for instructional use, according to a recently released survey by The National Center for Education Statistics (NCES), U.S. Department of Education. These schools, found NCES, represent one-half of all secondary schools, 14 percent of all elementary schools and 19 percent of all other types of schools, such as vocational, special education and combined elementary and secondary schools.

The survey, conducted last October, polled a national sample of 579 school districts, representing 15,834 districts nationwide. It was intended to fill the gap in planning information available to individuals interested in the educational use of computers.

Among the survey's findings:

- School districts across the country make almost 52,000 computers available to students. Microcomputers outnumber terminals connected to a central processor three to two.
- Despite the seemingly high total number of computers, availability within districts is limited. In the majority of districts having computers, only one elementary school and/or one secondary school has computer access.
- About 18 percent of the districts that provide no current access plan to initiate student use of computers within three years.
- The most frequently reported use is for computer literacy; other major uses are to improve student learning in selected subject areas and to challenge high achievers.
- More than 40 percent of the districts surveyed identified teacher training and a greater range of instructional software as the most pressing educational computing needs. Planning, technical and financial support were also mentioned.

To obtain a copy of the preliminary report on "Student Use of Computers in Schools," or to be placed on the mailing list to receive the forthcoming final report, contact Jeanette Goor, National Center for Education Statistics, Room 620, Presidential Building, 6525 Belcrest Rd., Hyattsville, MD 20782.

Short Takes

- A free list of current juvenile nonfiction and fiction books about computers is available from Bayshore Books. Compiled by Betty Wall, a media specialist, the list is a resource for librarians, teachers and media specialists who want to begin a collection of computer awareness books. For a copy, send a stamped, self-addressed envelope marked "List" to: Bayshore Books, P.O. Box 848NL, Nokomis, FL 33555.
- *Microcomputer Site Directory: Applications in Educational Settings,* published by Gutman Library, Harvard Graduate School of Education, lists more than 250 educational sites across the country where microcomputers are used for instructional and administrative purposes. Sites are listed by state, with a detailed subject index. The 40-page directory, which is $5.00 prepaid, is available from Gutman Library, Appian Way, Cambridge, MA 02138.

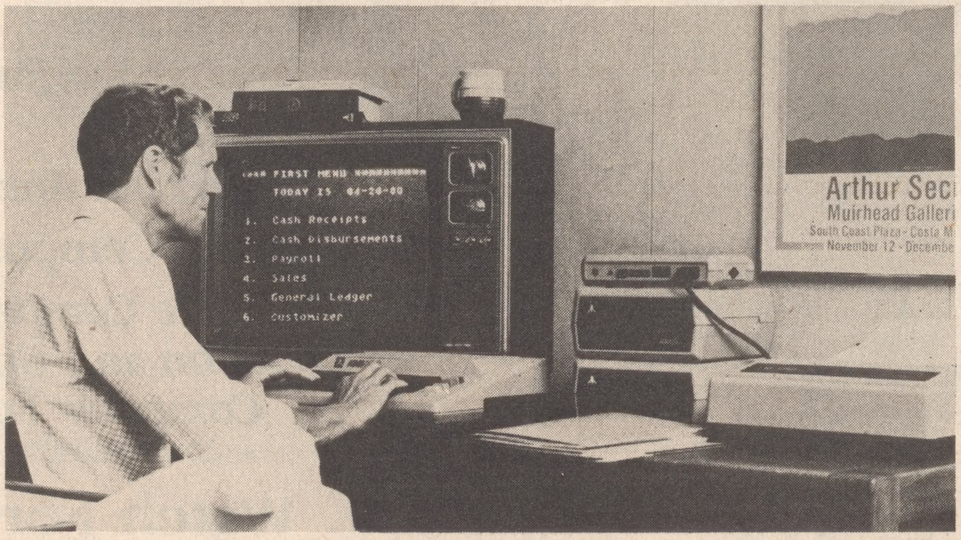
Atari Announces Software Program

Atari, Inc., has launched a software acquisition program to expand its store of education, home entertainment, self-improvement and personal finance programs. Atari wants high quality programs that can be used immediately, and easily, by people with little or no training in the use of computers.

The acquisition program involves the creation of Atari Software Acquisition Program regional centers where qualified developers can work with Atari equipment and receive technical assistance, and *Atari Program Exchange,* a free quarterly catalog of user-written software to be distributed to Atari computer owners. Atari will also offer periodic technical seminars for qualified software authors to familiarize them with the inner workings of Atari computer programs and to enable them to write programs for Atari 400 and 800 computers.

Authors who have software published in the *Atari Program Exchange* will be eligible for prizes totaling $75,000 worth of Atari products and a $25,000 cash grand prize. Atari will hold a contest every three months, and three prizes will be awarded for best program in each of four categories—consumer, business, education and systems software. The grand prize will be awarded for the best program submitted during the contest year.

For information on software submission, and for catalog and contest details, write: Atari, Inc., 1265 Borregas Ave., P.O. Box 427, Sunnyvale, CA 94086.



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Courtesy of Atari, Inc.

The right education, home entertainment or business program for the Atari 400 or 800 computer will win $25,000.

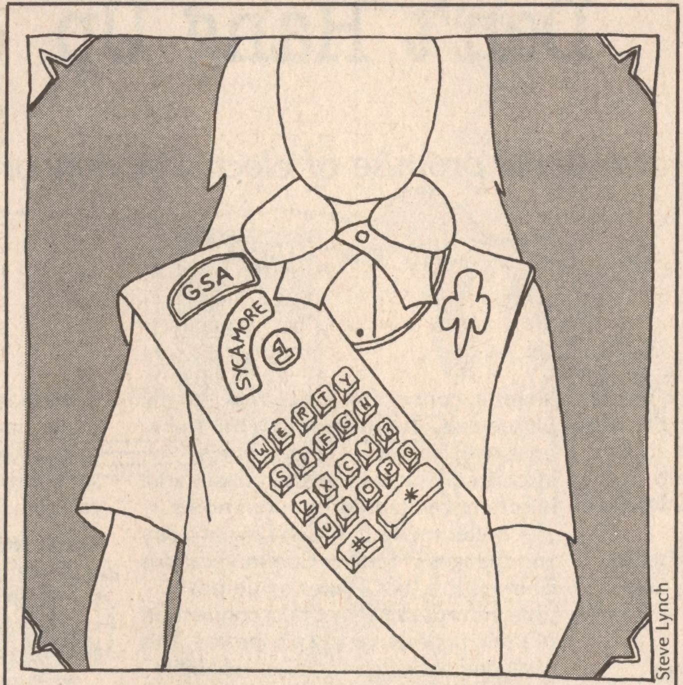
Computer Book-of-the-Month

If your notion of getting back to basics includes puzzling out data statements, loops and other programming fundamentals, the new Computer Book Club might be for you.

Tab Books Inc., of Blue Ridge Summit, Pa., launched the club this spring. The Computer Book Club will offer a full range of instructions for computer programming in do-it-yourself and ready-to-run formats that take a nontechnical approach to achieving maximum computer performance.

While the book club is designed for home computerists and computer hobbyists, the educator interested in programming might find helpful titles. The more than 60 books initially offered by the club include titles targeted to all levels of personal computer experience and interests, encompassing hardware, software, applications and theory.

For more information, write Tab Books Inc., Blue Ridge Summit, PA 17214. If you enclose a self-addressed, stamped, business-sized envelope, they'll send you a free copy of TAB's *Pocket Guide to BASIC.*



Steve Lynch

Of Cookies and Computers

The next time a young trooper comes around selling chocolate-mint cookies, look closely at the badges decorating her green uniform. One of them might carry the binary legend: 00111
10011.

Not a group to fall behind the times, Girl Scouts of the U.S.A. now offers a badge in computers. To win her badge, the enterprising scout must complete six activities, including: "Spend half an hour learning something from a computer either through Computer Assisted Instruction (CAI) at a school or learning center or by using a computer educational toy."

Other activities include inviting someone who works with computers to talk to the troop, thinking up a computerized robot and what it would do, and demonstrating how to count in the binary system.

Could computerized cookie sales be far behind?

Degree Programs in Educational Computing

Stanford University and Lehigh University have both announced new, graduate programs in educational computing.

Starting this fall, the Stanford School of Education will offer a Master of Arts degree in interactive educational technology. The program will combine courses in computer science, educational psychology, and curriculum theory and design. According to its developers, it will prepare graduates "to apply educational principles and educational technology to improve educational resources of schools, homes and industries."

The Lehigh program, which is already going, leads to a Master of Science degree in educational technology. The program combines the resources of three departments of Lehigh's School of Education and the university's division of Computing and Information Science. It does not emphasize computer science or data processing, but does prepare students to design, implement and evaluate microcomputer materials and programs for use in the classroom or in corporate training.

For further information: The Interactive Educational Technology Program, Admissions Office, School of Education, Stanford University, Stanford, CA 94305.

Dr. Leroy J. Tuscher, Educational Technology Coordinator, School of Education, 524 Brodhead Ave., Lehigh University, Bethlehem, PA 18015.

Magazines of Interest

Educational computing magazines are popping up like spring crocuses, attesting to the sunny days ahead for the educational computing field. *CCN* has recently learned of two publications that might interest readers:

Microcomputers in Education: This monthly newsletter includes software reviews, article and book reviews, new product announcements, reports on computers in the classroom and event listings. It is published by Queue, a Connecticut-based group that also publishes a directory of educational software available for the Apple, Atari, PET and TRS-80. *Microcomputers in Education* began publishing early this year. An annual subscription is $15. For further information, write *Microcomputers in Education,* Queue, 5 Chapel Hill Drive, Fairfield, CT 06432.

CourseWare Magazine: Each issue of *CourseWare Magazine* offers teachers two ready-to-use programs on cassette, accompanied by user and teacher guides and worksheets. According to the publication's statement of purpose, "*CourseWare Magazine* intends to publish documented, educational programs for the Apple II, PET and TRS-80 microcomputers which may be used by pre-college students at home or in the class." Programs will be selected from the areas of business, consumer economics, English, fine arts, foreign language, industrial arts, mathematics, physical education, science and social studies, or from teacher-assistance programs. *CourseWare Magazine,* which began publishing in September 1980, will appear five times annually. Yearly subscriptions are $50. For more information, write *CourseWare Magazine,* 4919 N. Millbrook #222, Fresno, CA 93726.

If a Computer Answers, Don't Hang Up

The educational promise of electronic networking

by T. G. Lee

If you have a microcomputer but don't have the necessary gizmos to transform it into a terminal that communicates with the outside world, you and your students are missing a whole dimension in microcomputing.

"Kids all over the world are excited about working with computers," says Barry Underwood, member of a networking project in British Columbia. "They are discovering things about computers that would be helpful to others. Wouldn't our society benefit if students in Campbell River, B.C., could exchange ideas with students in Michigan?"

It's an exciting concept—students and educators from across North America communicating with each other by computer. Students talking to students, students talking to teachers, teachers talking to teachers, teachers talking to administrators. And what makes it even better is that it's possible right now. We're not talking about some new technology, but about here-and-now systems educators can put to work.

By using a microcomputer and existing telecommunication systems, teachers and students can economically and easily communicate down the hall, across town, across the United States or to another country. In addition to communicating, they can retrieve information and other services from remote data banks.

How It Works

Networking, the development that makes all this possible, uses the telephone lines as a communication link between distant computers. The use of terminals to communicate over the telephone network is nothing new. In the 1960's, after two California doctors invented a *modem* (short for Modulator/Demodulator), a device that connects a teletypewriter to a telephone, deaf people began using this method to "talk" to one another. They still do.

These early modems used an *acoustic coupler,* a muff-like device that holds a conventional telephone handset, connecting the terminal to the phone line. This method can be, and is, used with microcomputers, but is associated with transmission losses and interferences caused by room noises.

A better method, which new circuitry and changes in Federal Communications Commission (FCC) rules made possible, now permits the direct connection of a microcomputer to a phone line. This vastly improves transmission reliability and also solves the problem of new-model phones that don't fit the standard muffs on acoustic couplers.

Modems provide a number of useful features, including automatic dialing and automatic answering capabilities. The latter means that a teacher from Boise can leave the bibliography you wanted on your computer while you're reviewing theorems with your seventh-period class. Most personal microcomputer modems can transmit 30 characters per second, or 300 *baud.* (The speed of transmission is measured in *bauds.*) Modems that are appropriate for the small-computer user are available today for as little as $150 plain to $400 fancy.

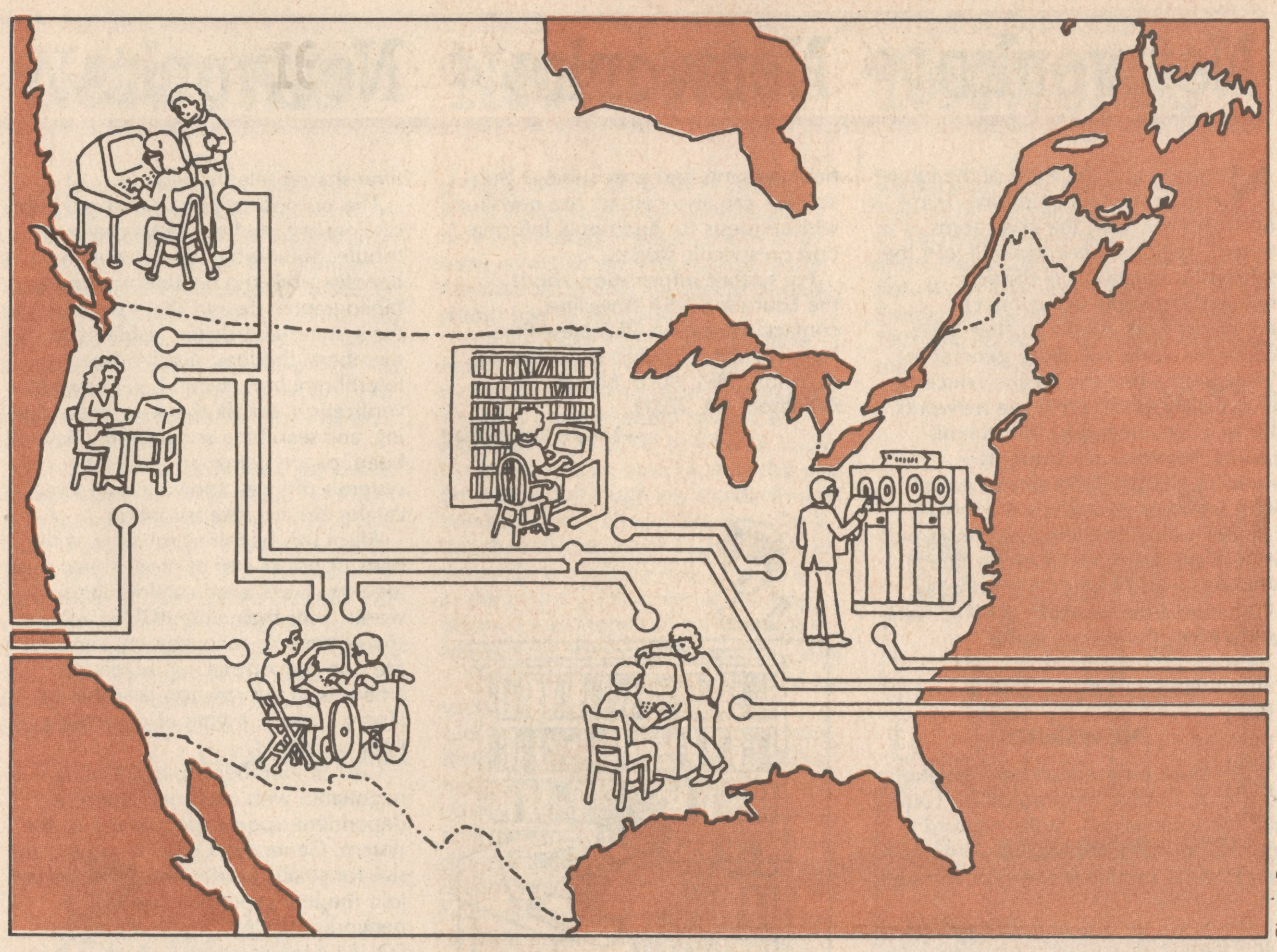
> *A seminar on the teaching of writing is about to begin, but the participating teachers have traveled no further than their schools' computer rooms.*

In addition to a modem, a microcomputer needs a software program to transform it into a communicating terminal. Such programs are available for as little as $50. Terminals can be either dumb or smart. A dumb terminal (Who would want one?) operates much like a conventional teletypewriter: you type in data that is either displayed on a screen or typed out by a printer. More sophisticated software can make a terminal smart. Smart terminals can run or copy programs automatically and can do such nifty things as automatically ask a caller to identify him/her/itself.

Smart Talk

Smart terminals talking to smart terminals open a world of new possibilities for educational computing. Consider the following:

- A small, advanced English class meets weekly to discuss Shakespearean tragedy. One student glances out the window at the snowy Vermont streets, another's mind drifts to the weekend beach party she and her Ft. Lauderdale friends have planned, while their teacher, sitting in her Chicago classroom, waits for a third pupil's opinion on the symbolism of the Fool in *King Lear.* The Special Scholar Network makes this and other specialty courses possible.
- A counselor taps into the College and University Data Base and ten minutes later has a list of schools that fit the profile—size, location, academic requirements—the student he's counseling has indicated.
- An administrator is asking her school board to approve a $20,000 expenditure for an energy management system. She logs on to her computer bulletin board and requests that other administrators who have such systems share their experiences. Two days later, her computer mail box is overflowing with reports she can use to buttress her proposal.
- Two weeks into the Intramural Academic Olympics, the third graders from P.S. 206 in Brooklyn, N.Y., are leading the spelling bee, while the math team from The Burkhalter School in Oakland, Calif., has the edge in the fraction finals.
- A seminar on the teaching of writing is about to begin, but the participating teachers have traveled no further than their schools' computer rooms. A week, a month, a year later, they can review the presentation—or the ensuing conversation—by



Ginger Brown

inserting the appropriate disk into their computers.

Models for Education

While these services do not yet exist, all of them are possible and many have working correlates in non-educational areas.

The Electronic Information Exchange System (EIES) centered at the New Jersey Institute of Technology provides an excellent model for computer conferencing. The EIES folks use Telenet, a data processing service, to connect members. By using self-answering modems, members can exchange messages at any time. The National Science Foundation sponsors the project.

Another exciting network is the Personal Computing Network (PCNET), a project of the People's Computer Company, Menlo Park, Calif. PCNET is a computerized bulletin board that uses computers and the telephone network instead of thumb tacks and paper. All a subscriber needs is a personal computer operating as a 300 baud terminal and an auto-dial/auto-answer modem. The People's Computer Company makes a software program called PAN available. Members exchange and relay messages late at night and on weekends when phone rates are lower. Again, a nice model for education.

In every field, someone keeps tabs on things. In the case of online data bases, it's Martha Williams from the University of Illinois. She is the editor of the ever-expanding reference book, *Computer-Readable Data Bases: A Directory and Data Sourcebook.*

The major vendors of the data bases that Williams covers are Bibliographic Retrieval Services, Lockheed Information Systems (DIALOG), Systems Development Corporation (ORBIT), The National Library of Medicine and The Information Bank (*New York Times*). Generally speaking, these are academic and bibliographic in content. They require professional, sophisticated searching techniques, and the literature in the field is a struggle for the novice, as this brief example from *Online: The Magazine for Online Information Systems* illustrates: "The solution is to use the KEEP function and the set 99. When constructing the Search Save, substitute set 99 for the subject set. Search Save will work even if set 99 is a nul set. When performing the search, KEEP the subject set and EXECUTE the Search Save." Wow!

Friendly Utilities

More useful to schools are the so-called *information utilities.* While they lack the search precision of the bibliographic data bases, they are much friendlier to users.

The Source and MicroNET, the major information utilities, put a supermarket of information services at your fingertips. You can call up a restaurant review or the Dow Jones, a spelling drill or your daily horoscope; you can check your mailbox, "chat" with an educator five states away, sell a program through the bulletin board.

The information utilities offer a variety of data bases useful for education. The two Source services we at the Ontonagon Area High School Library, Ontonagon, Mich., have found most useful are the abilities to key-word search the UPI wire service and to retrieve information available from *The New York Times* Consumer Data Base. Another Source service, "Computer Search International," is establishing a comprehensive online listing of job descriptions and applicant qualifications. So far the listings are sparse in some fields. I occasionally check the education area, only to find no listings. Rather depressing. But the computer listing, which is far from sparse, is a cheering alternative.

In addition to these general network

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Networks • Networks • Networks •

Networking is the wave of the future in educational computing. Local networks will span the classrooms of a school; regional networks will join the schools in neighboring districts; national networks will connect educators from Alaska to New York. Some networks will share general information; some the arcane concerns of specialty fields. We'll see networks for teachers, networks for administrators, networks for students—networks for any educational group with information and ideas to share.

Networking puts libraries, conference rooms and want ads all at the user's fingertips. And it's just beginning in education. The networks profiled here are a hint of what's to come.

Education USA Newsline

The latest information on legislation, research, funding opportunities, court rulings, changes in regulations and other events affecting education is now available at a touch of the keys, through the Education USA Newsline.

The National School Public Relations Association, publisher of *Education USA*, is making the newsline available through The Source. For an $850 one-time charge ($100 for hook-up to The Source; $750 for the newsline), any educator who has a computer or a terminal and a modem can use the service. In addition, subscribers have access to all other Source data bases, including a substantial number of educational programs. Users pay The Source's regular rates—25 cents per minute during the business day and just a fraction over seven cents per minute at other times—each time they engage the network.

Education USA Newsline updates the news twice daily, at 10 AM and 3 PM Eastern Standard Time. However, subscribers can access the news whenever they need to—immediately or months after initial transmission. In addition to news and features (the newsline promises feature articles sharing "cost-saving ideas on energy conservation, instructional materials, new equipment, bulk purchase plans, etc.") Education USA Newsline provides topic searches that transform it into a handy research tool, a bulletin board for subscriber announcements and user surveys. Subscribers can also contact the newsline with requests for additional information on specific stories.

For further information about the Education USA Newsline contact: Education USA Newsline, National School Public Relations Association, 1801 North Moore St., Arlington, VA 22209.

—Laurie Beckelman

Libraries

Libraries have come to depend on two types of networks: those involved with cataloguing and other cooperative activities, and those supporting commercial information retrieval services. Usually, the utility that makes both of these possible is itself a regional telecommunications network.

Cataloguing networks, some regional and some national, are the most established library networks. The classic example is OCLC, Inc., formerly the Ohio College Library Center. In 1968, the OCLC was a regional cooperative processing center that "hope[d] to attract 58 to 60 institutional libraries . . . for its processing and central cataloguing information functions." Today, it has some 2,000 members and several competitors. Users access OCLC's enormous computer data banks over time-shared telephone lines.

The purpose of the system is shared cataloguing, and each member contributes some original material and benefits from the existing wealth of bibliographic data in the system. Since the system records the holdings of all members, the logical extensions to interlibrary borrowing, bibliographic verification, serials check-in and claiming, and searching and ordering have all been, or are being, added to the system's services. Individual on-line catalogues are also an option.

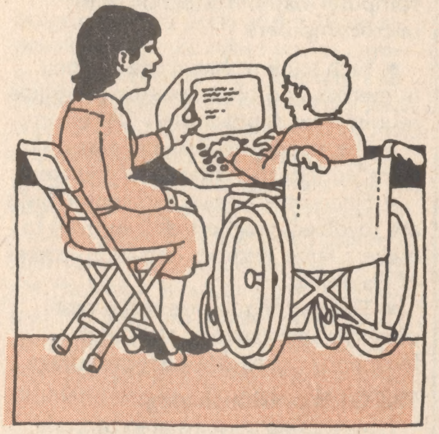
All of this becomes valuable as the costs of books and of professional cataloguing rise. Shared cataloguing networks, with their potential for other shared records-management services, are one way of making increasing amounts of information available to library users in a time of decreasing library budgets.

Cost of membership in OCLC is negotiated with each new member, dependent upon expected use of the system. Generally, OCLC is too expensive for small libraries, though these can join the less expensive regional networks (NELINET in New England; SOLINET in the South), which in turn are members of OCLC. For more information write: OCLC, Inc., 6565 Frantz Rd., Dublin, OH 43017.

Information retrieval networks offer a very different kind of service. Since the 1850s, printed indexes of published material, especially of periodical articles, have been produced, such as the *Reader's Guide to Periodical Literature*. Until the information explosion of the 1960s, this material was indexed and retrieved manually. Fortunately, the explosion in publishing dovetailed with advancements in managing information electronically. Project INTREX (Information Transfer Experiments) at MIT, a study in information transfer, showed how useful and acceptable to the public computerized information retrieval could be. At the same time, publishers of large indexing services, such as *Chemical Abstracts,* started using computers to speed publication. A by-product of this was the magnetic tape from which the pages were printed. A thriving industry has now grown up to search these tapes; local and regional telecommunications networks link their customers to information retrieval companies, such as Lockheed Information Systems' DIALOG, the System Development Corporation's ORBIT and the Bibliographic Retrieval Service (BRS). The number of data bases and the networks to access them have grown rapidly over the past few years. Today, with over 500 currently available data bases, involving over 150 million records, virtually everyone can have access to published material on almost any subject.

For a guide to data bases, see the biannual *Directory of On-Line Information Sources*, available from CSG Press, 11301 Rockville Pike, Kensington, MD 20795 ($12 per issue; $10 prepaid). Another helpful publication, *Directory of Library Networks and Cooperating Library Organizations*, costs $6 from the U.S. Superintendent of Documents, U.S. Government Publishing Office, Washington, D.C. 20402.

—Katharine G. Cipolla



Special Needs

Each school day, over four million handicapped children attend special educational programs in the United States. They are taught and counselled by over one million specially trained professionals. These numbers may seem large, but when distributed evenly throughout the nation's 16,000 school districts, handicapped children and their teachers become a very special and isolated minority.

Special education teachers and administrators frequently feel that others do not understand the needs of special education programs within the public schools. While this sense of isolation is not about to change dramatically, new technology is beginning to offer some effective ways to improve communication among the special people within special education.

A number of recent projects have established local communications networks specifically for special educators. The HEX bulletin board system, established by AMRAD of Vienna, Va., is a microcomputer-based system that can be accessed through any standard computer terminal. The system provides a forum to discuss issues in special education. HEX is available free to anyone in the country. However, it is a long distance telephone call for those not calling from the Washington, D.C., area.

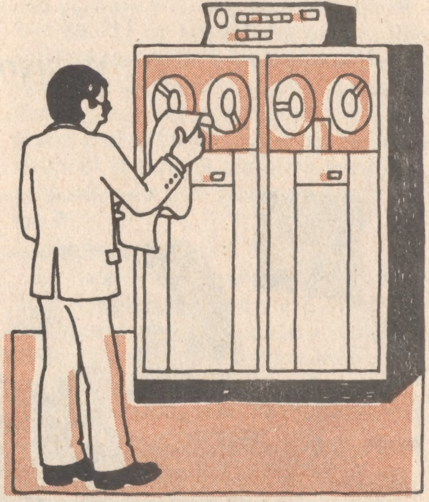
The GNAT system was developed for special educators in Alaska. Every special education program in the state that has a telephone may use the GNAT microcomputer to communicate with others on the state special education system. The state special education office in Juneau, which funded the system development, plays the role of both innovator for Alaskan special education and quality-control coordinator of the state's special education services. GNAT is helping the special education office and is playing an important role in facilitating communication over a geographic area that spans several time zones.

On a broader scale, developments are now underway for a nationwide computer-based communication system for those interested in special education. SpecialNet, planned to begin next October, will be accessed through a local phone call from over 250 U.S. cities.

When fully implemented, SpecialNet will bring together special education administrators at the state, local and school level, special and regular education teachers, parents of handicapped children, and regional and local special education resource organizations. The system will allow users to get answers to questions such as: how will the new federal budget affect Title I funding? What job openings are available in New England for speech therapists? Are any conferences on programs for deaf-blind children coming up?

In addition to personal mail and special education bulletin boards, SpecialNet will send on-line newsletters to microcomputers that have auto-answer capabilities. For more information about SpecialNet, write: Dr. Gary Snodgrass, Associate Director, NASDSE, 1201 16th St., N.W., Suite 610E, Washington, D.C. 20036.

— Kirk Wilson



Ginger Brown

Computer Science

CSNET—it stands for Computer Science Research Network, but what does it really mean? For the computer science research community it means a tremendous step toward better research capabilities, wider dissemination of work and greater teamwork among scholars in different parts of the country. For the larger educational community, CSNET is a model network in research and education.

CSNET will link all the major computer science research data bases in the country. Subsidized by the National Science Foundation for the next five years ($4.9 million), the network will tap into the computers of major universities, government agencies and industry. Its purpose is to give researchers access to more information through high-speed communications. Initially, CSNET will provide electronic mail service, allowing users to send files and messages. Remote resource sharing will be the second service available. This means users will also be able to access ap-

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Disk Sharing: The Best of Two Worlds

A low-cost way to increase the computing power of your Apples, PETs and TRS-80s

by *William J. Wagner*

Courtesy of Corvus Systems, Inc.

At Saratoga High School, Saratoga, Calif., a Corvus Constellation Network allows 14 Apple computers to tap into a single disk.

Most teachers who have made the switch to classroom microcomputers feel no regret about leaving behind the telephone problems and other hassles associated with time sharing. Nonetheless, there are still situations where even the most powerful microcomputers can't measure up to time-shared systems in terms of available storage capacity, ability to simultaneously send demonstration or tutorial programs to individual students, ready access to a number of large programs and provisions for keeping programs safe from adolescent pranks.

Fortunately, there's an interesting solution that offers educators the best of both worlds: the concept of *disk sharing*. In a disk-sharing system, all the microcomputers in a classroom have access to a central disk storage device for loading and maintaining programs, but can revert to their independent status once disk access becomes terminated. Thus, the school doesn't have to supply a separate disk or cassette drive for each of its computers.

Disk sharing has a number of other advantages that make it easier for teachers to implement meaningful computer-based instruction with microcomputers:

- Each student has access to the numerous and often lengthy programs required for sophisticated CAI efforts.
- The need to constantly pass disks from student to student is eliminated.
- Since only one or two central disks are involved, teachers do not have to make a large number of backup copies of class disks.
- The technique presents a cost-effective alternative to slow and frequently unreliable cassette storage.

The Costs of Disk Sharing

Disk-sharing systems are currently available for most of the popular microcomputers. Costs, which run the gamut from nothing (!) to over $10,000, depend upon the capacity and type of common storage device used, and on the sophistication of the controlling software.

Shared storage capacity can range from a 5-inch floppy disk (approximately 100,000 Bytes) to a fixed hard disk with over 30 million Bytes—the equivalent of 300 floppies. The most capable systems on the market may incorporate queuing software to handle simultaneous requests for disk access, ability to send messages from the central unit to the satellites and/or pass messages between individual stations, or password setups that restrict access to designated sections of the storage area.

To determine the value of disk sharing for a particular application, you should decide how many stations your budget will allow. A simple calculation usually demonstrates how much money you can save by eliminating expensive disk drives for all the computers in the program; these funds are now available for purchasing a disk-sharing system, and enough may be left over to obtain additional computers or "extras," such as software and maintenance, that budgets tend to omit.

If this calculation does not clearly state the case for disk sharing, try to figure in the human costs. How much time is wasted in attempting to get programs into several student stations, in keeping track of numerous floppy disks or in making backup copies of each disk in general use?

A No-Frills Network

At a price of $500, Radio Shack's Network system provides a convenient and simple means of implementing disk sharing for TRS-80 microcomputers. A Model I or Model III TRS-80 with one disk drive serves as the master computer in such a system; Network enables connecting up to 16 TRS-80s to this central station, and each satellite can save or load programs from the single disk.

The teacher can either send a program out to each of the 16 units simultaneously or select which computers will receive the program. The student at each receiving station must type CLOAD and press ENTER to make the computer think it is receiving a program via cassette recorder. The drawback here is that the program is transmitted at cassette speed (painfully slow compared with disk speed). On the other hand, there is little risk that the program will not load, as is sometimes the case with cassette recorders. Speed is becoming less of a problem: the latest version of the Network can load programs into Model IIIs at three times the standard cassette rate. In addition, you can use any CLOADed program with the Network, including word processing programs written in machine language.

If students wish to save programs, the teacher must tell the Network which station is sending. The student then types CSAVE "name," causing the program to pass onto the disk (again, at cassette speed).

A networked TRS-80 system offers significant advantages in terms of saving RAM (random access memory) or program space. A disk operating system in a TRS-80 takes up about 10 K of RAM, compared to a few hundred Bytes for the Commodore PET. Thus, school users who want disk access on individual TRS-80s must pay for an extra 16K of RAM, which lists for $120. Under the Network system, however, only the teacher's unit requires the additional memory; the student stations can be minimal 16K systems in which the entire RAM is available for programs.

Cost savings for networking are also substantial. The list price for a Network system with the maximum 16 student stations (standard Model IIIs at $999 apiece) and a teacher station is well under $20,000; the actual cost runs approximately $16,000, including Radio Shack's quantity discount. At this price, you could buy perhaps 10 Model III computers with disk drives—and you'd still be stuck with the hassle of making backup copies and getting demonstrations or lessons out to each student. Moreover, the purchase of separate cassette players for 16 computers would entail almost double the $500 investment required for a single Network unit.

Simultaneous requests for disk access, ability to send messages from the central computer to the satellites, passwords that restrict access—all are possible with disk sharing systems.

Disk-Sharing for Free

A significant feature of the Commodore PET makes this computer particularly adaptable to disk sharing: using standard cables, you can plug a number of PETs into a single disk drive. Each PET hardwired into the drive can access it to save or load programs, but the drive functions as if it were hooked up to just one PET. However, this technique has no provisions for handling simultaneous requests or a request that arrives during the performance of a command.

A no-cost disk sharing system currently in operation at several schools in the San Francisco Bay Area gets around these problems in an ingenious manner. The system consists of a large red block that sits on top of the disk drive. If a student wishes to access the disk, he/she must bring the block to his/her station. Upon completion of the disk task, the student returns the block to its place atop the disk drive. In other words, if you don't have the block, you shouldn't perform a disk command.

This simple idea is very appealing, especially since it relies on human cooperation rather than technology. In practice, however, the system does have one drawback: implementing the capability requires installation of a $30 chip on PETs older than the current 4000 series.

Other disk-sharing systems for the PET provide substantial software for processing disk commands. Skyles Electric of Mountain View, Calif., produces two such systems, which cost from $95 to $170 per computer. Providing more system software than the Network, the systems can accommodate automatic handling of concurrent commands by different machines.

One of the earliest disk sharing systems for microcomputers was produced in 1978 by Nestar Systems of Palo Alto, Calif. Using a PET to control a dual 8-inch disk drive, the firm's Cluster/One can operate with any combination of TRS-80, PET or Apple II computers. (Before you get your hopes up, you should note that the Apple can only access the Apple programs, the PET only PET programs and so forth.) This system is in use in about 30 schools around the country, primarily as a disk-sharing system for PETs.

Sophisticated Apples

Perhaps it is fitting that only expensive disk operating systems are available for the most expensive popular microcomputer, the Apple II. Nestar offers a sophisticated system called the Model A. Designed for use with up to 64 Apples, the system provides disk queuing, printer queuing, message passing between stations and from the central station to each satellite, and locking files. Users can choose between dual 8-inch floppy disks containing over a million Bytes of storage or a hard disk with either 16.5 or 33 million Bytes. The company estimates that this system can be obtained for about $2,800 per station; naturally, the cost per station decreases with the number of stations.

Model A systems have been installed in Norman High School, Norman, Okla.; Mill Creek Township High School, Erie, Pa.; Oglala Sioux College, Rapid City, S.D.; and Monterrey Institute of Technology, Monterrey, Mexico. This last represents one of the largest institutional investments in disk-sharing equipment. The college's 12 campuses ultimately plan to obtain 1,000 Apples, including four Model A systems, in the future.

One of the most intriguing Model A applications is located at Sesame Park, an educational amusement park near Philadelphia sponsored by the Children's Television Workshop. One part of the park contains computers in an arcade setup. The computers (Apples in disguise) play educational games for a price, and are all hooked up to a Nestar Model A disk sharing system. This arrangement allows Sesame Park to take advantage of the color, graphics and sound capabilities of the Apple while

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TERC:
A Place to Learn and Share

A model computer resource center is bringing computer literacy to teachers and administrators

by Susan Mirin

Terry McKoy

Around the corner from Brattle Street shops and a laser flash from Harvard Yard in Cambridge, Massachusetts, 8 Eliot Street houses a string of cozy, asymmetrical offices. The ambience contrasts sharply with the technological images that the sign outside—Technical Educational Research Centers—evokes.

But the ambience is appropriate. Although Technical Education Research Centers (TERC) comes complete with a microcomputer laboratory and a staff that discusses lab interfaces and computer literacy with ease, its emphasis is on human service: meeting the needs of educators and students.

Technical Education Research Centers, Inc., was founded in 1965 to carry out educational research and development through several centers and affiliated groups, two of which are located in Cambridge (a third is in Waco, Texas). TERC focuses on serving the educational needs of previously underserved populations. From an initial goal of improving technical and occupational education, it has broadened its purpose to include education and guidance for the handicapped and those who serve them, for special needs students, for adults seeking social change, for women pursuing skilled vocations (particularly in traditionally male fields), for students interested in careers in the arts and humanities, and for educators and scientists concerned with electronic instrumentation and microcomputers.

As increasing numbers of microcomputers began appearing in school libraries and classrooms, TERC staff saw the need to help educators make informed decisions about the educational uses of computers. In April 1980, TERC founded the Computer Resource Center as part of one of its Cambridge branches.

The Computer Resource Center (CRC) is a model for the kind of shared computer facility educators throughout the country need. Its director, Daniel H. Watt, describes three goals for the center: (1) providing teacher training that will enable educators both to develop computer literacy in students and to use computers to enhance instruction; (2) making information available to educators for decision making related to computer use; and (3) developing a community of people interested in using computers in education.

A strong philosophy of educational computing feeds efforts in all these areas. "The computer makes possible entirely new ways of learning," says Watt. "When children learn to program, for example, they also learn problem solving and a new way of thinking about mathematics. But this won't happen if the computer is used superficially, just to buttress existing curriculum."

CRC strives to give educators the experience with and the confidence in computers they need to stretch the computer's teaching potential to its limit. "If students are educated to control the computer rather than be controlled by it," writes the staff, "microcomputers in the schools can have a profound and positive impact on education."

Micro Lab

A microcomputer laboratory, called Micro Lab, is the heart of Computer Resource Center activities. It is equipped with Radio Shack, Apple, Atari, Compucolor, Texas Instruments, Sinclair and KIM computers, most acquired free through laborious negotiations with stores and manufacturers. Micro Lab is where CRC members come to use the center, where educators come for workshops, where interns come to conduct their projects.

Tim Barclay, staff associate, says that two general groups of educators use the Micro Lab: those who need to do something about computers for their schools—often administrators and department heads—and those who "want to learn more about computers because they are personally meaningful to them."

"Our laboratory is a place where educators can come and try out microcomputers under supervision," says Barclay. While CRC does not have enough staff to offer instruction, Barclay and Watt orient teachers to the center, show them how to use the equipment and help with problems that arise. Often, more experienced visitors help newcomers; CRC has spawned the desired "community" of computing educators.

Educators most often first come to the Micro Lab during Wednesday drop-in hours, 1-8 PM. The center is open, free to all, during that time, and visitors can try out the available hardware and software. CRC's software collection is small but representative of the various types of educational software—simulation, drill and practice, games, LOGO, computer-assisted instruction, among others. Manufacturers have donated much of the software, often with the caveat that is for demonstration only. Users *cannot* copy CRC software.

Internships

For $25, educators can join CRC and use the Micro Lab during non-drop-in hours. The center also invites educators to apply for one- or two-semester internships. No money passes hands between CRC and its interns; the payment, instead, is the project, which is designed to be mutually beneficial. Whether an intern is helping conduct workshops or writing programs, spending two hours a week or two days, his or her project meets individual educational goals. Often, says Barclay, interns want to become computer education resource specialists, returning to their school systems to help develop computer literacy and computer-aided instruction programs.

Workshops are CRC's other major activity. CRC's brochure outlines six specific workshops, but Barclay notes that workshop providers assess participants' interests and needs and focus material appropriately. The usual format involves one full day or two half days at the center. CRC also contracts with school systems to provide special workshops for selected teachers and administrators at their school. In the latter case, CRC staff pack hardware, software and peripherals into a van, for they consider "hands-on" experience an essential workshop component..

Finding Funding

Although CRC raises some revenue through workshops and other services, most of its funding comes from government grants to TERC, and proposal writing is an important staff activity. For example, Barclay is presently seeking funding from the National Science Foundation's Project RISE (Research in Science Education). If funded, his project will explore the potential of the microcomputer as a laboratory tool. "The possibilities are endless and exciting," says Barclay. "Remember that junior high school experiment in materials transformation where the students take moth flakes, heat them until they melt and then watch them cool and solidify? The students had to constantly watch the clock, recording times and temperatures—all they were able to think about was the *recording* of the information. Now, by putting a temperature probe that's connected to a microcomputer into the water, the student can *watch* the moth flakes change form while the computer records all the relevant data, prints out graphs and charts and does any number of things with the information. This kind of educational experience allows students to explore more of the world around them than was previously possible."

> *Often more experienced visitors help newcomers, creating a community of computing educators in the Micro Lab.*

Barclay feels that the potential services CRC could deliver are endless, but that the current funding situation is discouraging. "Right now we're dealing with two problems," he said, "Proposition 2½ [recent Mass. referendum cutting property taxes] and Reagan. There is both less local tax support and decreased government support for education. The only hope is that science and technology will continue to be priorities."

Starting a Resource Center

Finding funding is a major problem for any educational organization that might want to start a computer resource center. "Substantial numbers of up-front dollars are needed to get the hardware, software and technical competence you need," says Adeline Naiman, managing director of TERC. However, assuming that an organization can resolve the funding issue, whether through government or foundation grants or other means, Naiman stresses that the hardest part of starting a computer resource center is finding the people to staff it.

"You need top-notch, experienced people who can support the level of competence needed to provide these services, and who are committed to the goals and values of education," she says. "Such people are often hard to come by since they're very employable in a variety of high-priced positions." Both Watt and Barclay have substantial teaching and computing backgrounds.

Naiman also notes the need for office space in a central location easily accessible to teachers, for a variety of equipment and software, and for a resource library. In addition, she feels that an organization providing such services should create regional and national networks so that information sharing occurs readily. For example, TERC is part of the Computer Education Resource Coalition (CERC), an informal group based at Lesley College, Cambridge, and comprised of several organizations in the Boston area that provide computer-related services to educators. Its purpose is to share information regarding relevant resources in educational computing (such as seminars, courses, consulting services and software sources) with educators and with each other.

And at the national level, CRC is one of approximately 15 regional computer education laboratories across the nation participating in the MicroSIFT network. As a member of this network, CRC has helped design a pilot evaluation tool for computer-based instructional packages. "At present," says Barclay, "There are no standards for assessing software—for seeing what's useful and what's not." Once a comprehensive tool is developed and validated, MicroSIFT plans to develop a long-term approach to assessing the quality of

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RALPH McGILL BLVD
THURS-SUN
OCTOBER 29-NOVEMBER 1
10 AM TO 7 PM

Make Them an Offer They Can't Refuse

One business education teacher's answer to budgets and requisitions

by Pamela Beer

Next year, I plan to have a computer in my classroom, though my director doesn't know it yet. I would never have said this a few years ago. I used to feel that making plans to purchase new equipment for my business education classes was a waste of time.

I would teach all year using old manual typewriters, two dictaphones and one mimeograph machine with a class of 35 students. Then, in the summer, I would spend three days sitting in workshops, listening to experienced teachers talk about their data processing equipment and watching slides of their classrooms filled with students working at L-shaped desks with new electronic typewriters. I would sit and pout because I never believed my students would have the same chance. But I finally decided that if others could get all that equipment, so could I.

I started listening and thinking of ways I could improve my classroom at the Nevada Area Vocational-Technical School, Nevada, Missouri. I have 37 juniors and seniors enrolled in a three-hour course on business and office education. The class consists of second-year typing students from four sending schools. These juniors and seniors represent a good cross section of the student body; their occupational goals range from highly technical vocations to general office work.

During the class, students work their way through the departments of a simulated office. They rotate positions, acting as a secretary in the shipping, transportation, purchasing, sales, legal, printing, filing, research, word processing, micrographics and bookkeeping departments of the fictitious firm. Self-paced, individualized instruction allows each trainee to proceed at his or her own rate. The primary goal of the course is to help students both understand the important stenographic functions performed in offices and develop the competencies necessary to apply these functions to related office procedures.

The Winning Idea

Today, I have all electric typewriters, a dictaphone for every three students, a wireless laboratory for shorthand, an offset press, a keypunch machine, two electronic composers and one electronic typewriter—and I'm working on that computer. I also lease a CPT Model 8000 word processor with a dual disk drive and a daisy wheel printer. (This model sells for $15,000.) The secret I discovered was that I could get the equipment if I could make it pay. I got out from behind the desk and started looking for outside work for the students to do in class.

I first publicized my program in the school, offering to have students type stencils for other teachers. This relieved the office help of having to type tests and run stencils for some of the teachers, and won their enthusiastic support. Other teachers also started praising the program, and the director actually started visiting my room to see how things were going. The result? A new Chief 17 offset press, to make the work more efficient. Yes, the responsibility was great, but the change in students' attitudes was also great. Students working on simulated jobs knew their work would be graded and thrown away, while these students knew that everyone in the school would see the job they'd done.

> *Students find the word processor untiring and interesting. Their classroom is the office of the future.*

As the enthusiasm in the class grew, so did the enrollment. Enrollment is the secret to success in purchasing new equipment. A director cannot turn down a request for new equipment if parents are complaining that their child was turned down because of an insufficient number of typewriters.

As the superintendent became aware of the work being done in my class, he became interested in having his secretaries use some of our equipment and in hiring students to lighten their load. Having recently become aware of the capabilities of word processors, I arranged for a more-than-willing sales representative to demonstrate one to the class and invited the superintendent's secretaries to listen. Word of mouth soon got us a word processor.

New Skills for Students

Students are now learning text merging, paragraph assembly, storing and retrieval, automatic repagination, global search and replace techniques, right margin justification and alphanumeric sorting. They have entered all school records—including lists of vendors, student body mailing lists and teachers' syllabi—on diskette for permanent storage; they prepare checks for all school expenditures and maintain inventory; they help local businessmen with mailings.

Before and after school, office secretaries use the word processor, thus justifying the expense involved in such a purchase. The machine is also used during the summer months, when the superintendent's secretaries take over running checks and local mailings.

The students love it. They find the word processor untiring, interesting and effective in helping them save production time and in solving difficult tasks with minimal effort. They even volunteer to work on the word processor in free time: "I can stay and work on this for you next hour. We aren't doing anything in that class today." In my opinion, the word processor has had a positive effect on learning.

Office of the Future

The days of sitting behind the desk grading papers while students type are gone. My classroom is now the office of the future. Students' resumes no longer read, experience on manual typewriter and one week on dictaphone. They now have numerous skills listed under experience, including the payroll and inventory control experience they get through the word processor's math program disk. Employers are now calling the school, asking

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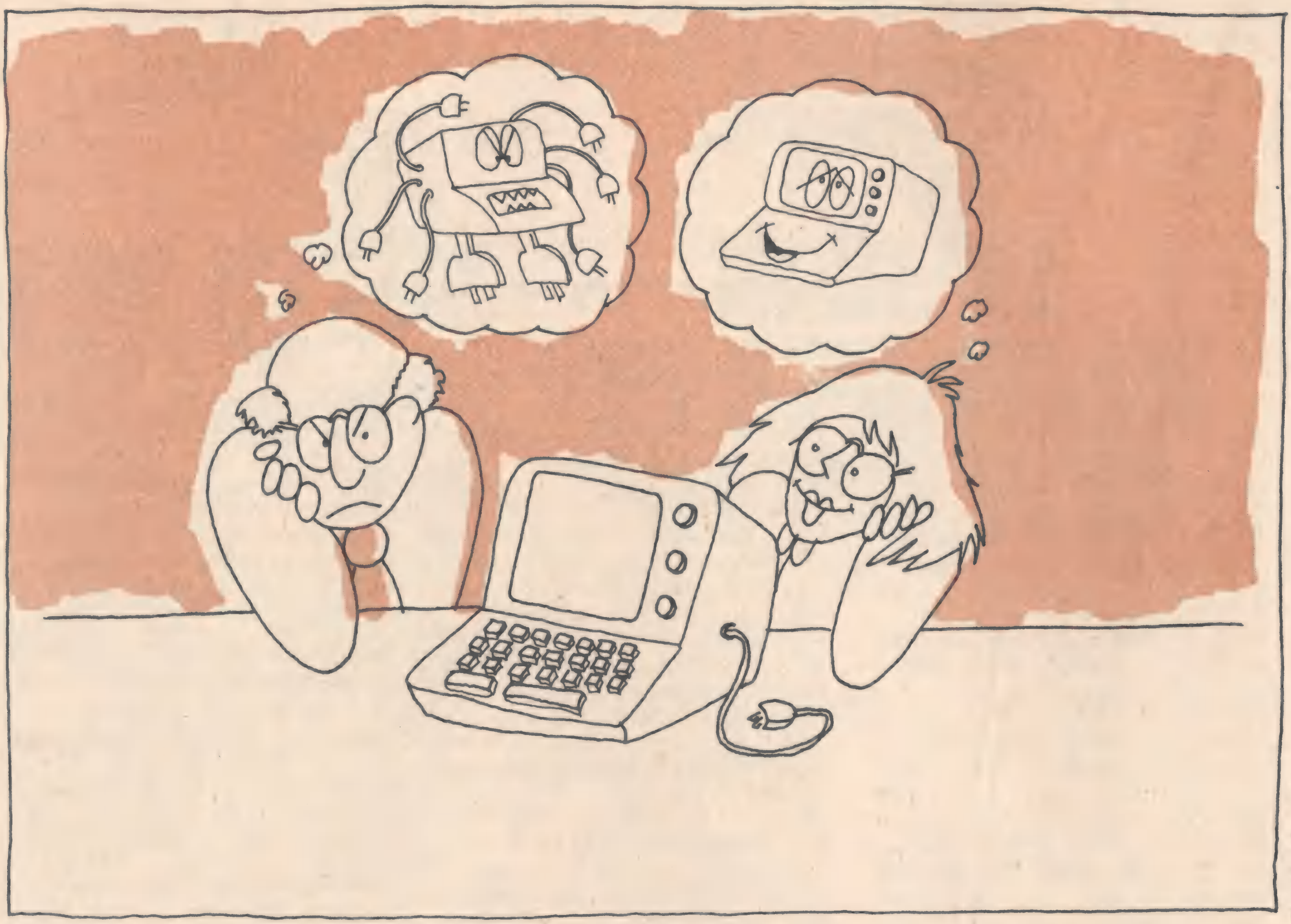
Steve Lynch

The Mushy, Murky Mire of the Microcomputer Mystique

Our intrepid correspondent says stamp! Stamp out the misplaced fear of microcomputers

by Gloria Stein

Are you a reluctant teacher, suspicious that microcomputers are endowed with magical powers and have mysterious designs on you? Give one the acid test. Turn it on. When it winks at you—particularly if it says READY—embrace it lovingly and cry, "Ready? Of course, I'm ready." If you expect an electronic experience, you'll be disappointed, barring a short circuit.

Microcomputers are not magic from any point of view. If anything, they tend toward stupidity, poor things, and desperately need to be led with love and understanding. According to one eleven-year-old, "Most computers do good things but that is not their intention. They only do what they are programmed to do." Regardless, they clearly evidence the capacity to intimidate some adults.

Tentative Approaches

Grouped together in in-service workshops, many teachers make their first computer approach willingly but gingerly, mesmerized as by a weaving cobra. Nervous laughter and bum jokes punctuate their conversation. Much prodding ultimately entices a group member to do it. The brave volunteer is then scrutinized by machine and fellow teachers alike. Should the victim respond incorrectly and receive a written rap on the knuckles from the computer, the poor soul is bombarded with good-natured taunts. Secretly, however, everyone knew all along that the computer was out to get him, and now they have positive proof.

All together, now: Stamp! 'Taint so.

To further muddle the situation, programs often demand identification of the user. Most teachers, even the wary, politely introduce themselves, except for the likes of a certain principal who insists on calling himself Blort, obviously requiring assurance that, later on, the computer will be unable to track him down.

When the micro, innocently following directions, snaps out a sassy remark directed to the user by name, recognition of the ultimate horror cannot be denied: the computer is now in complete control, functioning independently, thinking for itself.

Stamp! Harder! Simply untrue.

Where lies the fountainhead of this mystique? Is it the micro's inscrutable, blank face and its implacable insistence on not making the first move? Or does that incessant, blinking little light have the same anxiety-raising effect as a stern teacher tapping a staccato toe? Who knows. But don't stop stamping. Hesitation and uneasiness are unjustified.

Not convinced? Looking at the computer's working components might help. You might speculate why anything so neat and tidy should cost so much money. It certainly is unimpressive compared to the innards of your automobile. Take a good look, though. One day you will have deep respect for this miracle of technology.

Those tiny, boxy gizmos—the integrated circuits—have the capacity to store information and instructions and to compute. One little critter in there is a microprocessor, the director of operations. When you aren't looking, it tears around obediently following the directions from the program, gleans the needed information and computations from the proper gizmos in the proper order and pops on the screen whatever is necessary so you can join in the fun. Over and over, it repeats this process until the program calls a halt. Big deal. That's its job.

Does that incessant, blinking little light have the same anxiety-raising effect as a stern teacher tapping a staccato toe?

Stamp down the idea that you are inadequate if you do not fully comprehend the computer's circulatory and digestive systems. How often do you contemplate the movement of your pistons?

A Humble Servant

Humbly and accurately, the microprocessor and its cohorts will work hard and serve you well. For example, a microcomputer in your classroom relieves you of the frustrating task of wrenching time from the daily schedule to give a student, or group of students, concentrated attention. Selective choice of programs addresses the needs of these students. Now, you are free to continue with the rest of the gang while the "micro students" obtain stimulating, individual attention, loving every minute of it.

Or take another tack. Set up the micro for a large group presentation, freeing yourself to work with the individuals.

Matching the right program with the right student/s virtually guarantees a successful session. Most children employ a level of diligence and application while working with a computer that they just can't seem to drum up for traditional classroom activities. The increased investment pays off; youngsters will often finally master a concept that has been taught to them for years.

A kind of "instant learning" occurs. One sixth-grade lass commented, "I learned a lot of state capitals just playing the program twice." This phenomenon is neatly explained by another sixth-grade sage: "If kids can learn while they are having fun, whatever they're learning will really sink in."

Conversely, the microcomputer appears to have a soothing effect on the anxious over-achiever. "For some reason, I don't feel extra bad when the computer says 'No' to me." And gifted youngsters are quick to spot and appreciate the "integrity" of a microcomputer. "Sometimes teachers are willing to make allowances in schoolwork. Computers won't."

Many programs, encompassing a variety of disciplines, point out an incorrect response immediately, and often allow the youngster a second chance. To quote one fifth grader: "A computer tells you right away that you made a mistake and let's you try again. That's a lot better than getting your paper back all marked up in red pencil."

A microcomputer is an excellent tool for both the remedial student and the one who excells, so do not mentally slot it for any particular level. It is impartially exoteric in sharing its beneficence. Stamp out the notion that its application is limited and, therefore, of little use to you.

Nothing is Everything

Nor will a computer ever replace the human brain lodged in the dome of a good teacher. To bolster your ego a bit, ponder this: a computer could not function without the concept of zero. How can a device elicit fearful awe when it is totally dependent on "nothing"?

A computer cannot make the myriad judgments demanded of you on any given day. It cannot relate. It cannot relieve pain, share in little joys, revel in successes, discuss a batch of new kittens or buy a box of Girl Scout cookies.

Your intelligence, experience and expertise elevate this machine to the level of a good, educational tool. Your selection of programs, your creative application of its potential in your classroom are indispensable to attain success. You use it; it does not use you. If you need reassurance, turn to the kids. "Computers should stay in schools but only to help teachers. Computers can't take the job that was meant for people." Another young voice: "Computers aren't as good as mankind because without mankind there would be no computers."

Whether you program the computer yourself or use another's handiwork, you never lose control. If all else fails, you can always pull the plug, which is more control than you have with a recalcitrant, obstreperous or lethargic student, not to mention an administrator. Teachers will not be replaced by computers so, come on, stamp away.

How can a machine elicit fearful awe when it is totally dependent on 'zero'?

(Not on an administrator, please. Negotiations are tough enough.)

Hang in there and expect an attitudinal change. Experience the joy of getting successfully loaded for the first time. Discover the sense of power when you interrupt the computer in mid-sentence. Witness, with satisfaction, its immediate, obedient response as it humbly awaits your next command, respectfully bowing its little CPU.

Establish a nice, warm working relationship with a microcomputer and the obvious will be substantiated: computers are one of the greatest things to hit the field of education since Gutenberg. Their ability to motivate is prodigious, and without motivation, a whole bunch of teaching may be going on, but darn little learning.

Join in, teachers. Give the micros a try and keep stamping. Stamp away that mushy, murky mire of the misplaced microcomputer mystique! (My, your shoes are a mess.)

Gloria Stein, a sixth-grade teacher in Ann Arbor, Michigan, has written a booklet called Irreverent: Reference Resource for the Recent Receiver of a new PET*!*

The Computer and Basic Math Instruction: The Promise and the Problem

by William J. Wagner

Since computerized instruction was introduced in the 1960's, computers and basic mathematics have been an easy and familiar match. The computer is well suited to the short answer format and emphasis on numbers of basic math. Further, the sequential nature of the pre-algebra curriculum (addition, subtraction, multiplication and division of whole numbers, fractions and decimals) and the rote nature of traditional teaching and testing are consistent with a computerized approach. Finally, although it is widely taught, basic math is not so widely mastered. Math teachers are always looking for new and more effective means of teaching.

Varied Formats

Math teachers have often spearheaded the use of computers in schools, and a wide selection of math programs in a variety of formats is now available. *Drill and practice*, by far the most common format, offers a mechanized worksheet that provides instant feedback to the student's reply. Some instruction is supplied where necessary, and advanced programming techniques can make the drill more palatable. For example, in a program developed in the San Diego City Schools' Title IV-C Math Project, the student races a car around a track by providing correct, quick answers to typical short answer questions on topics such as division of fractions. The computer's car moves if the student's answer is incorrect or too slow.

Yet even the most imaginative drill and practice program fails to answer a common criticism: do we wish the computer merely to replace the traditional worksheet full of problems? No matter how spicy the format, drill is still drill.

In *computer-assisted instruction* (CAI), the computer teaches a concept, tests it and loops back to portions of the instruction as needed. The computer remembers the position of each student in the curriculum and keeps records of individual progress. CAI can be very expensive because of the sophisticated software needed, the on-line memory requirements and the cost of giving each student a computer.

Complete CAI curricula on large time-sharing computers are available from Computer Curriculum Corporation and Control Data Corporation (PLATO), among others. For personal computers, Milliken Publishing Company offers a CAI program with record keeping and automatic student advancement within sub-content areas such as decimals.

The cost of commercial CAI has led some educators to team with programmers to produce authoring languages that allow teachers to write lessons for computer instruction without actually programming the machine. Bell & Howell has a commercial authoring language available (GENIS I), and Ted Perry, a psychologist with the San Juan, California, School District, has experimented with a more sophisticated language as part of a Title IV-C curriculum development project.

In *computer-managed instruction* (CMI), another format, the computer gives short tests and assignments based on the student's performance, keeping records of each session. Instruction takes place without the machine. In the best of these systems, teachers have access to individual and class records, can change the order or content of the curriculum and can control the assignments the computer makes. Science Research Associates' (SRA) *Classroom Management System* (basic math section) is an outstanding CMI package.

> *We have all seen individual programs that teach a given topic creatively, but even 10 or 20 elegant programs may not constitute a coherent package.*

Simulation programs present real-life situations that require basic math calculations to achieve a specified goal. *Lemonade* is a good example. In this program for the Apple, participants run a lemonade stand, making decisions about production, selling price and advertising. At the simplest level, a player must keep expenses within budget. More advanced participants try to maximize return on investment by understanding the mechanism of supply and demand contained in the program. We need many more such lively and nontraditional simulation programs.

Finally, various *demonstration programs* help the teacher reinforce concepts. One program uses graphics to represent fractions. Another draws better polygons than the teacher can, while a third leads the student step-by-step through a given concept—the long division algorithm, for instance. These programs can supplement instruction for individuals or for an entire class. SRA's AIDE and Radio Shack's *K-8 Math Program* are examples.

Potential and Problems

This broad range of applications is beginning to realize the computer's potential for creative instruction. As a patient, private, neutral instructional device, the computer can be a means to true individualization, freeing teachers from the tedious parts of teaching and making new ways of learning possible.

Now that so many math programs are available, we must assess our progress and consider the future. Producing quality programs for basic math instruction has been much more difficult than anticipated. Furthermore, few math educators are satisfied with the computer's contribution to reducing teacher workload in a cost-effective way. We are realizing that while math seems to be a natural subject for computer applications, some difficulties exist.

First, the basic math curriculum is a long and fairly inflexible sequence of many small steps, with few options in the order of presentation. We have all seen individual programs that teach or drill a given topic creatively, but even 10 or 20 elegant programs may not constitute a coherent package. The pieces must fit together in several respects.

Coherence—A Must

Suppose I have gathered several programs that teach fraction concepts. (We'll assume that they all work on the same computer.) I really need two things from this set of programs. First, students must be able to progress from one program to another, forward and backward as necessary, gradually building their understanding and becoming more adept at the operations. Second, I require that these programs speak roughly the same language at comparable levels of sophistication.

And so I challenge would-be curriculum developers to plan unified, coherent packages whose component programs fit together both pedagogically and intellectually, with sufficient record-keeping ability to free the teacher for more creative tasks.

Coherence of style, level and order may be less important for older students, who are reviewing, than for younger ones encountering the ideas for the first time. While everyone must learn the same basic mathematics, the intellectual interests and instructional goals of bright fifth graders are very different from those of struggling high school students who are seeing fractions and decimals for the fifth year in a row. Therefore, each program should be aimed at a specific student audience.

Few teachers can deal successfully with many different ages and ability levels, and no single program should try to address all types of students. Instead, the programmer/teacher should choose an audience and concentrate on selecting material with the appropriate psychology and reading level, and with the correct mixture of theory, instruction, drill, review and reward.

Joanne Rudnytsky, author of programs for Quality Educational Design, Inc., has addressed this problem with a unique set of programs for 36 different sub-topics in basic math. Two programs cover each topic. One deals with the essentials of the subject; the other provides enrichment activities.

The question of different student ability levels raises another difficulty. What is the correct mix of theory, instruction and drill? This is mathematics, after all, and any particular operation has a foundation in theory deep enough to turn off anyone but the most dedicated mathematician.

Any teacher, textbook author or educational programmer has to decide how much to say about even such simple matters as borrowing (Why do we tack the one onto the column we are working on?) or division of decimals (Why move the point?). Or, to choose a more complex example, how do we justify the algorithms for square roots and for conversion from Base 10 to another base?

As teachers, we can sense how much theory is appropriate for a particular class or student. As programmers, we must decide whether to concentrate merely on drill and rote explanations, or whether to explain matters more fully. The answer depends upon audience needs and the goals of instruction.

Beyond Mathematics

Besides curricular barriers to the productive, efficient and widespread use of computers in basic math instruction, other problems exist that are not peculiar to math alone. They relate to teacher training and workload, proper planning and the need for research.

Teachers, like the general public, exhibit a range of attitudes about computers, including fear, mistrust, ignorance and lack of confidence. Many would like to use computers in their teaching, but don't know how to start or where to get the necessary help and information. There is a scarcity of in-service computer training for classroom people. Administrators need to recognize the value of such programs and lend their support.

Computer education cannot continue to grow without careful study of the process and the results: which kids are being helped and how?

This training should not be limited to programming. The syllabus should include terminology, components of a computer system, types of hardware and software, uses of computers in education, sources of help and information, and basic curriculum design.

A roomful of computers will never be as hassle-free as a set of workbooks, and this problem must be addressed. Administrators should anticipate the need to devote some personnel time to maintaining the equipment. Manufacturers and vendors should not minimize the difficulties involved when nontechnical people take charge of complicated machines. Finally, teachers should not agree to add a computer assignment to regular teaching duties without recognizing the extra time required.

We commonly see computers bought piecemeal, with no long-range plan for their use. Some schools forget to budget for software; others select computers that are not suitable for the task at hand. Here administrators can play a key role by supporting the enthusiasm of those staff members who wish to try computers, while helping them develop clear purposes and goals. Inadequate planning results in poor advertisements for computers in education.

Research and Rethinking

Computer education cannot continue to grow without careful study of the process and the results. We have outgrown general talk about kids' enthusiasm, increased interest in the subject and new love of school. Researchers must determine just which kids are being helped and how. What kinds of computer instruction are most effective? How many computers are needed per class to produce cost-effective results? What are good strategies for smooth start-up and effective expansion of a computer curriculum?

In one study by Richard Pitschka, a teacher at Fremont School in Hollister, California, students using computer-assisted drill and practice produced remarkable improvement on a standardized test compared with a control group in the same school. We need more such studies to build confidence in this mode of instruction. I am convinced it will stand the scrutiny of researchers.

Finally, I urge math educators to reexamine the basic curriculum in light of increased availability of calculators and computers, and in light of societal changes such as the introduction of the metric system. Which basics are still basic? Is the arithmetic of fractions still important when the metric system removes one of its main justifications? Does anyone still need to do lengthy multiplication or division problems without a calculator?

Then, too, we must ask ourselves whether we purposely avoid instruction in more intuitive areas such as open-ended problem-solving, estimating and building a sense of quantity and variation. After all, teaching the traditional rote material is so much easier.

The microcomputer is a powerful teaching tool. But let's not use the new technology to further entrench a tired curriculum. Instead, let us consider first what should be taught and then how computers can help teach it effectively.

William J. Wagner is coordinator for computer education, Santa Clara County, California. He is also a regional contributor for Classroom Computer News.

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Networks

Cont. from page 9

plications software.

Access to the CSNET data bases will work just as other on-line data bases work. The user will need a terminal and a modem in order to connect to the nearest network computer (TYMNET, Telenet or Arpanet, the large, existing network lines over which the CSNET system will run). The cost to the user will be the cost of the terminal and the communication link. Under the NSF subsidy, there will not be a useage charge for the information. However, users will have to meet NSF requirements for membership.

Development work for the network is now underway at University of Wisconsin-Madison, University of Delaware, Purdue University, University of Utah, and at the Rand Corporation. The NSF plans to have several university data bases connected to the network by this summer. By early 1982, it expects to have 15 data bases on line; by 1986, 100.

For more information on CSNET, contact Charles Kern, National Science Foundation, Washington, D.C. 20550.

— Sharmon J. Hilfinger

Dr. Kirk Wilson is a research associate at the Boston University School of Education.

Katharine G. Cipolla is the media librarian at Barker Library, Massachusetts Institute of Technology.

Sharmon J. Hilfinger is an electronic publishing consultant with Shotwell and Associates in San Francisco.

Disk Sharing

Cont. from page 11

maintaining a convenient central storage area for programs.

Corvus, Inc., a manufacturer of fixed hard disk systems in San Jose, Calif., has a disk-sharing system called the Constellation, which enables disk sharing among up to 64 Apples, TRS-80 Model Is or Model IIs, S-100 computers or any combination of these machines. Constellation software costs $750, plus about $300 for each computer interface. For an additional $40, the firm supplies a program that can copy onto a standard video cassette to provide backup for the hard disk.

One system of this type, installed at Saratoga High School in Saratoga, Calif., shows what can be achieved with a lot of money and careful planning. The instructor, Hal Dueck, can request his beginning programming students to individually load a program from the disk—a task that is completed in seconds. After discussion of the program, Dueck gives an assignment to modify the program or write one similar to it; upon completion of this assignment, the students save their programs on the hard disk, perhaps for eventual printing by a student aide. If all students were to save their programs simultaneously, the process would still take just a few seconds.

Each student has a password that acts as a key to a particular part of the system. For instance, PASCAL programming is not available to everyone, and students who wish to do required exercises in math or social science during their free periods have passwords that give them access to these programs alone, on a read-only basis.

In addition, Dueck provides a publicly announced password for anyone who wishes to experiment with the system, learn BASIC independently or play games. If games seem to be taking up an inordinate amount of time, they can easily be dropped from the list for that password. Students initially attracted to the computer by games will often stay to learn programming when the games are no longer available.

Disk-sharing systems can make a significant contribution to the classroom, and any school contemplating a large investment in microcomputers should explore the possibilities in this area. Commercially available systems vary tremendously in capability and price. However, the value of anything that simplifies using computers cannot be gauged in dollars—especially if it makes life easier for teachers, the most precious computer resource.

William J. Wagner is coordinator for computer education, Santa Clara County, California. He is also a regional contributor for Classroom Computer News.

TERC

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distributed software and to disseminate the evaluation data to potential users.

Needs Assessment

"Underlying any activity with this scope," suggests Naiman, "should be a needs assessment that pinpoints what people want and need." For example, TERC attained a virtual printout of educational computing needs in the Northeast after conducting a three-month study of the role of the microcomputer in Northeastern schools (six New England states and New York). Conducted under contract for the Northeast Regional Educational Planning Project, the study told TERC staff just "what is there and what is needed."

The problems they discovered—how to train teachers so they are comfortable with microcomputers and can stay ahead of their students; how to learn about and select software—are the ones they're addressing through CRC.

"At present," says Naiman, "The needs we're seeking to meet are evident —our major problem is that we're torn about where to spend our time and resources."

Susan Mirin is a free-lance writer and editor.

Business Education

Cont. from page 15

if we have students available for employment.

I am no longer worried about a student having nothing to do or about discipline problems in the classroom. I am concerned instead with inventory, supplies, deadlines and mailability—just as in any office. I have found many strengths in this real-work method of teaching: demanding professional behavior patterns reinforces self-discipline, maturity and accountability. Trainees have an opportunity for hands-on learning and the responsibility accompanying a position involving decision-making skills. Their finished work is a measure and record of their work habits.

I am presently laying the foundation for purchasing a computer to help trainees learn simple business operations. I plan to purchase computer-based lessons that meet our specific education goals and to organize an advisory committee to consult on the needs and the implications of introducing a microcomputer into the curriculum.

But first, I have to prove to the school administration that work a-plenty can be done on a computer.

Pamela Porr Beer's articles have appeared in Business Education World, VocEd, Today's Secretary *and* The Journal of Business Education.

Library Networks: Conquering Geographical and Financial Barriers

by Katharine G. Cipolla

The time is long gone when students or teachers could expect to find everything they could possibly need in their local school or public libraries. The inflation rate for books and periodicals has been above the national inflation rate for some time, while institutional and public support for information services has been shrinking. Libraries close earlier and remain closed on weekends, book budgets are level or decreased, staff positions are left unfilled, even though the public's need for information grows.

Cooperation between libraries has been a remedy for some of these problems. Most states have established networks of regional information centers to which smaller libraries can turn for help. Colleges and universities have similar arrangements. The small information center can call on its nearest large neighbor for material it lacks or can no longer afford. But, as the financial situation worsens, even the larger institutions may not have everything their region needs.

The Network Solution

Enter the state, regional and national library networks. These networks make the information resources of a large geographical area available to their members. Examples are the Research Libraries Group (RLG), a national network of large university research libraries; the OCLC, Inc., a huge network of all sorts of large and small libraries that began life as the Ohio Library College Center; and the New York State Inter-Library Loan Network (NYSILL), a state network for interlibrary cooperation. These networks are especially valuable to isolated information centers.

Clarkson College of Technology, in Potsdam, New York, is one institution for which these networks are very important. Clarkson has a student body of 3800, of which 3500 are undergraduates, most majoring in science or engineering. The students' need for current information is high, and the library of 130,000 volumes can satisfy only part of it. Recently, in a large, well publicized project, Clarkson consolidated three of its information services into an Educational Resources Center (ERC), a new facility that includes the library, the media facilities and the computer center. As part of this development, Clarkson acknowledged its local limitations and its dependence on shared resources; it became involved, the college says, "with supporting resource networks in order to ensure that the required resources can be available on a reasonable time and cost basis." The Educational Resources Center and three neighbor institutions have formed the St. Lawrence Valley Associated College Consortium, giving a combined resource of 700,000 volumes. The ERC also participates in the North Country Reference and Research Resources Council, with 40 regional members, NYSILL, which includes the State Library and 14 major research institutions, and OCLC. Through these networks, Clarkson uses rapid computer and telecommunications technologies to extend the reach of its students to local, regional, state and, finally, national information sources.

> *Library networks use rapid computer technology to extend the reach of their students to local, state and national information sources.*

Similarly, the computer center of the ERC belongs to EDUCOM and SHARE networks, and anticipates participation in EDUNET and CONDUIT for educational computing. A combination of these facilities is planned so that students and faculty working at remote terminals in dormitory rooms, laboratories and offices can directly access the campus's store of information, from library materials to research data.

The Leafless Library

The system is even preparing for the day when books may be too costly to print or to ship, and electronic publishing becomes a reality that "could alter considerably the function of a library committed to a book-oriented collection." While this foresight has created some adverse publicity, including a *New York Times* editorial against "The Leafless, Lifeless Library" (NYT, 27 October 1980, p. 18), college officials say that it was one of the "driving forces" behind the combination of the three information facilities into the Educational Resources Center.

The imagination and apparent success of the Clarkson project is just one example of the use of new technology and networks to control and to access information. Clarkson is a special example because of its isolated location, distant from other large information centers. But similar systems are evolving, albeit more slowly, even in major urban centers like New York, Washington, San Francisco and Boston. Networking and library cooperation are now recognized by all institutions responsible for the provision of information to the public as the only practical way to deal with the vast quantity of information their users need.

Katharine G. Cipolla is the Media Services Librarian at Massachusetts Institute of Technology, Cambridge, Mass.

How Can a Computer Talk on the Telephone?

by Lloyd R. Prentice

My computer just learned how to dial the telephone. It also learned how to tell when another computer answers. When a human answers, it hangs up—and none too politely, either. It also hangs up when it gets a busy signal or when the ringing goes on too long. It can even answer the phone, but, again, it's decidedly rude unless another computer is on the line. Since my computer learned how to talk on the telephone, it's been chattering away with other computers like a sociable teenager. But it still lets me pick up the telephone bill.

There are lots of reasons why I'm delighted that my computer has learned how to talk on the telephone, however. Now my little computer can access larger computers in other parts of the country, giving me the benefits of sophisticated programs, large data banks and greater computing power. I can also share data, programs and text stored in my computer with friends across the country—provided that their computers are also set up to talk on the telephone.

A Little Black Box

The question is, just how does my computer do all this? The answer is, with the help of a black box called a modem, which costs in the range of $150 to $400. My computer is connected to one end of the modem and a telephone line is connected to the other. The modem transforms computer data into a form suitable for telephone transmission.

If you've been following this column for awhile, you know that modern digital computers work with an electrical equivalent of the binary system—information is represented through electrical switches that are either on or off. These switches are flipped from on to off and back again millions of times a second inside the computer, and this very speed of operation has a lot to do with the formidable power of the machine. But these tiny switches are either totally on or totally off; the computer just doesn't know what to do with "maybe."

Since telephone lines reach nearly every point in the world, it makes sense to think of the telephone when you want your computer to talk with other computers across the country. But the telephone system was designed for human voice—not digital data. Unlike the on-off digital signals, telephone signals are a whole range of maybe's. Talk loudly and you get a strong signal; talk softly and the signal is weak. Moreover, the telephone will only let signals that fall within the frequency range of human voice through the system; that is, signals within the 300 to 3300 cycle-per-second (Hz) frequency range. By being strict about this, Ma Bell can pack a lot more conversations on the lines per dollar of investment in the system.

My computer's been chattering with other computers like a sociable teenager. But it still lets me pick up the bill.

The absolute on-again/off-again computer signal of several million Hz clearly won't stand a chance with the telephone company unless something drastic is done to it. The drastic something is to first slow down the computer signal to something like 300 on/off excursions per second. This really isn't difficult for your computer to do. The rate of on/off (or off/on) excursions of the electrical signal is called the *baud* rate. The higher the baud rate, the more information you can send per second.

Next, we have to trick the telephone system into thinking that a human is talking. That's not so difficult, either. When the computer signal is off (binary 0), we send a tone at one audio frequency, say 1070 Hz, into the phone. When the computer signal is on (binary 1), we send a different tone, say 1270 Hz. All this goes on inside the modem. The process of creating these tones is called MOdulation. The process of transforming these tones back to binary computer signals, which has to happen on the other end of the line, is called DEModulation. Hence, MOdulation + DEModulation = MODEM.

There are two ways of hooking a modem up to the phone line—acoustically and electrically. With an acoustically coupled modem you just nestle the telephone handset into a rubber cradle on the top of the modem. Electrical connection requires an additional black box, often built right into the modem, called a Direct Access Arrangement, or DAA. The DAA protects your computer from electrical surges in the phone line and vice versa.

Model Modem

The standard for inexpensive modems in the United States was defined by the Bell system's Western Electric company when it made the Model 103 low-speed modem available to the data processing industry. At one time you had to go through the phone company and pay a stiff monthly charge when you wanted to send computer data over the phone. Thanks to a series of court decisions, this is no longer necessary. Today, many companies make 103-equivalent modems that comply with Federal Communications Commission specifications. If you are hooking into the telephone line electrically, you must notify the phone company and provide them with the FCC registration number of your DAA. There are no extra monthly charges beyond normal service, unless, of course, you are renting a phone company modem. If you are using an acoustically coupled modem, Ma Bell needn't be told a thing.

The simplest modem, called an *originate* modem, allows you to call other computers but not vice versa. Originate modems use tone frequencies of 1070 and 1270 Hz. An *answer* modem makes it possible for another computer to call you. It uses frequencies of 2025 and 2225 Hz. Originate/answer modems allow either option at the flip of a switch or under computer control. When you get into the $300 to $400 range, you get an originate/answer modem with some nifty extra features, such as auto-dial and auto-answer. These features allow your computer to talk unattended with other computers in the middle of the night when rates are low, providing, of course, that you have programmed it to do so. I really can't tell you how much you have to pay for a computer that picks up the tab for the phone bill, however. If you find out, please let me know.

CALENDAR

May

Microcomputers in Education. May 15-16. Bloomington High School, 10750 Laurel Ave., Bloomington, California. Sponsored by Computer-Using Educators. Will cover subjects ranging from "How to Get Started with Microcomputers" to "Evaluating Microcomputer Systems." Free software exchange. Contact: Forrest Miller, Pre-registration Chairman, San Bernardino County Schools, 602 S. Tippecanoe, San Bernardino, CA 92415; 714/838-1728.

National TRS-80 Microcomputer Show. May 21-23. New York Statler Exposition Hall, New York, New York. Speakers, seminars and exhibits. Contact: Kengore Corporation, Dept. 80, 3001 Route 27, Franklin Park, NJ 08823; 201/297-2526.

Introduction to Computer Graphics and Basic Programming. May 30. Micro Lab, TERC, 8 Eliot St., Cambridge, Mass. A hands-on workshop in graphics programming for teachers with little or no prior programming experience. Contact: Computer Resource Center, TERC, 8 Eliot St., Cambridge, MA 02138; 617/547-3890.

June

Applefest '81. June 6-7. Plaza Castle, Boston, Massachusetts. A computer show devoted exclusively to the Apple. Seminar program will feature different topic every hour; Apples in education will be covered. Exhibits of products and applications from around the country. Contact: Applefest '81, Boston Computer Society, Three Center Plaza, Boston, MA 02108; 617/367-8080.

Confronting Computer Anxiety. June 6. Micro Lab, TERC, 8 Eliot St., Cambridge, Mass. Workshop will introduce computers in non-threatening ways and illustrate their potential uses. Contact: Computer Resource Center, TERC, 8 Eliot St., Cambridge, MA 02138; 617/547-3890.

National Educational Computing Conference for 1981 (NECC-81). June 17-19. North Texas State University, Denton, Texas. For both experienced and new computer users; will stress the practical use of computers at all educational levels. All-day, preconference workshops also scheduled. Contact: Dr. James Poirot, Computer Science Department, Box 14886, North Texas State University, Denton, TX 76203.

The Uses of Microcomputers in the Teaching of Mathematics, Science and Computer Programming. June 21-July 3. The North Carolina School of Science and Mathematics, Durham, N.C. For N.C. science and math teachers or supervisors, Grades 11-12, only. Contact: Summer Workshops, NCSSM, 1912 W. Club Boulevard, Durham, NC 27705; 919/683-6664.

July

The Uses of Microcomputers in the Teaching of Mathematics, Science and Computer Programming. July 6-July 17. The North Carolina School of Science and Mathematics, Durham, N.C. For N.C. science and math teachers and supervisors, Grades 7-12, only. See June listing for address.

August

Third Annual Conference on Interactive Video Learning Systems. August 12-13. L.A. International Airport Marriott Hotel, Los Angeles, California. Sponsored by The Society for Applied Learning Technology (SALT). Conference will address advances in the use of interactive videotape and applications of the videodisc. Contact: Society for Applied Learning Technology, 50 Culpeper St., Warrenton, VA 22186; 703/347-0055.

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Language Arts for Apple

Milliken Publishing Company's language arts packages are now available for Apple computer systems. At present, the firm offers "Alphabetization" (Grades K-8) and "Homynyms" (Grades 3-10); modules planned for the *Grammar Problems for Practice* series include "Verbs," "Modifiers," Pronouns" and "Spelling."

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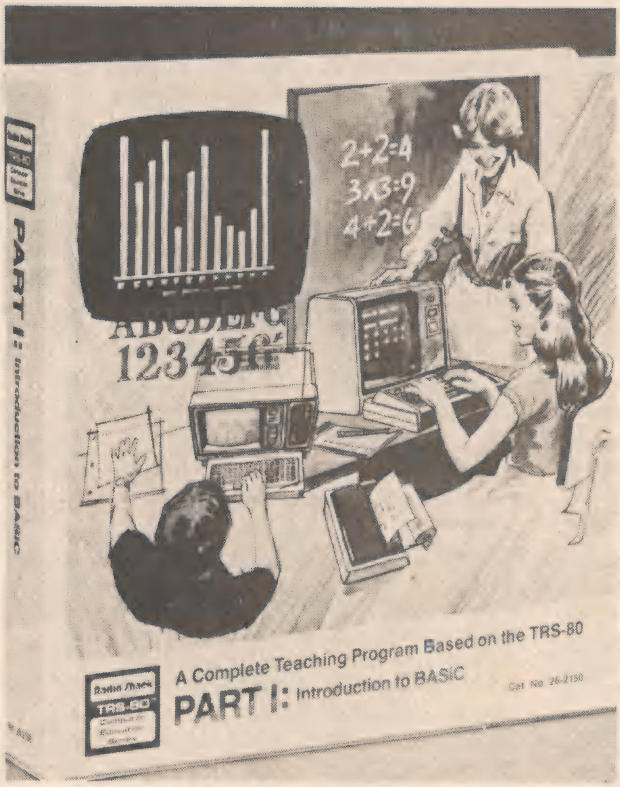
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3x3=9
4+2=6
ABCDEFG
1234567
PART I: Introduction to BASIC
Radio Shack TRS-80
A Complete Teaching Program Based on the TRS-80
PART I: Introduction to BASIC
Cat. No. 26-2150

Courtesy of Radio Shack

Radio Shack's *Introduction to BASIC Programming,* **part of the Computer Education Series**

Introduction to BASIC

Introduction to BASIC Programming, Part I is part of a complete classroom package, now available from Radio Shack, that is designed to provide students with a first experience in computer programming. It requires little programming or computer knowledge on the part of the instructor.

Part of Radio Shack's Computer Education Series, *Introduction to BASIC Programming, Part I* includes a teacher's manual, a set of transparencies for use with an overhead projector and 25 student workbooks (additional workbooks are available separately). One or more 4K or 6K Level I or Level II TRS-80 Model I Microcomputer Systems are required to use the program.

The package assists students in identifying important concepts, principles and techniques related to computer programming and provides them with a means of checking their knowledge of this information. It also gives students practice in writing computer programs in BASIC.

Each lesson consists of five parts, beginning with an "Overview" that provides a general orientation to topics the lesson covers. An "Objectives" section detailing the skills students will master on completion of the lesson follows. A "Note-Taking Guide" keeps students focused on the important aspects of materials presented via the overhead projector; a "Quick Quiz" lets them determine how well they've learned the contents of the lesson. Finally, the "Activity" portion of the lesson provides hands-on application of the concepts and techniques studied.

Radio Shack's TRS-80 *Introduction to BASIC Programming, Part I.* is available exclusively from participating Radio Shack stores and dealers, and Radio Shack Computer Centers, nationwide.

Managing Demons

L.I.F.E. Software Ltd. of Canada has added a teacher management system to its *Spelling Demons* microcomputer program. After entering a password, the teacher can choose from seven commands displayed on the screen: "List of Students," "Erase a Student's Record," "Report on a Student's Progress," "Create a New Records Disk," "Duplicate a Disk," "Add a New Student to the Disk," and "Return to Spelling Demons."

This executive software makes it easier to implement the 9,600-word *Spelling Demons* program, which starts with Grade 1 words and ends with words taken from the U.S. National Spelling Bee competitions. Available in both a standard version for Commodore PET microcomputers and a modified two-disk format for use with Apple systems, the complete package consists of the teacher management system, a program disk, a student data disk, a word editing program, 96 programs on 48 cassettes, four cassette albums and a user's manual.

For more information, contact L.I.F.E. Software Ltd., 146 Van Horne Ave., Willowdale, Ontario M2J 2T1, Canada; 416/491-2230.

For the Science Teacher

Science teachers might be interested in TEMPSENS, a new module that provides direct temperature input for a variety of popular microcomputers, including PET, Apple, KIM and TRS-80.

TEMPSENS is one of a growing array of microcomputer modules available from Connecticut microComputer that are designed to measure real world variables. Others measure weight, pressure, humidity, speed and fluid level.

Each TEMPSENS module provides two temperature probes and operates within a range of -10 F to +160 F. The probes are hermetically sealed and of high-quality, corrosion-resistant construction, with 12-foot leads.

TEMPSENS is one component of a modular system for translating physical variables into computer data. It requires two other modules for hook-up to the computer. For further information, contact Connecticut microComputer, Inc., 34 Del Mar Drive, Brookfield, CT 06804; 203/775-4595.

Portable CAI

Teaching/Learning Technologies has come out with a portable self-teaching system called Study-Pak. Consisting of a data terminal (about the size of a typical hand-held programmable calculator) and an instruction booklet, the system can operate with audiotape, film, videotape, slides and other media.

Study-Pak extends the breadth of CAI applications, since individual users can decide when and where to employ the unit. The self-prompting terminal provides immediate feedback for independent study, allowing students to evaluate their performance and progress at their own pace.

To begin a lesson, the student inserts a precoded strip on the back cover of a booklet into the data terminal. A series of pushbutton commands controls the pace of the program. Prompts and responses in words or numbers appear on the display screen; computer-generated sounds provide additional feedback.

With the system in "test" mode, the student can store answers to questions, request a score or review incorrect responses. The "study" mode gives instant audio and visual feedback. In addition, students can skip over any portions of the program they don't need or return to a specific section for further study.

Accommodating multiple-choice and true/false question formats, Study-Pak also has a modified branching capability and can be used for games or simulation. The courseware may consist of almost any self-teaching program format that incorporates active student participation. Translating written materials into Study-Pak programs does not require computer programming expertise.

For more information, write or call Stephen R. Knapp, Teaching/Learning Technologies, 2 Adler Park Plaza, 1641 N. Milwaukee Ave., Libertyville, IL 60048; 312/680-8081.

Interactive Math Programs

Quality Education Designs (QED) is now marketing two series of interactive computer programs for mathematics instruction at the upper elementary or junior high school level. *Factoring Whole Numbers* and *Fractions* cover 6 and 12 topics, respectively; each topic consists of an "A" program with a tutorial and practice session, and a "B" program that provides a game or enrichment activity to reinforce the concept taught in program "A." Both packages are available on diskette for Apple II computers and on diskette or tape for TRS-80 systems.

For further information, write to Quality Educational Designs, Dept. A, P.O. Box 12486, Portland, OR 97212.

PET Software Specialists Science and Education **APPLE**

Microphys Programs

Microphys, a leader in educational software design, is pleased to announce the development of two administrative software packages designed to manage *school attendance* reporting and to provide *schedule updates.*

(1) The *attendance system* enables a school to effectively and efficiently maintain and update *daily* and *cumulative* student attendance reporting. The daily attendance bulletin can be informatively annotated and school attendance statistics are computed and clearly displayed. Student records can be quickly searched to reveal absences on a particular day or within a specific time period.

(2) The scheduling-update system permits a school to manage changes in student schedules or the registration of new entrants during the school year. Guidance personnel enter student scheduling changes or new course assignments; the computer will then generate the add-drop forms; issue new class lists and print out new student schedules. True class counts and an up-to-date school course directory may be printed out at any time.

These packages are intended for use within a microcomputer environment consisting of an 8032 (or 8096) Commodore CBM computer, an 8050 dual disk drive, and a compatible printer. Schools with populations of less than 3000 students may be readily serviced by the above system.

The software has been designed so that school personnel can readily follow the step-by-step instructions which appear on the computer screen. These same instructions, with additional explanatory comments, appear in an easy to follow instruction manual.

Administrators and concerned school personnel are urged to write for additional details, sample print-outs, and a complete demonstration of the entire system. The financial savings and educational benefits to be accrued by the adoption of this system are tremendous and should be explored by virtually every school.

Educators should write for the Microphys Spring Catalog which describes over 180 programs for use in Chemistry, Physics, Calculus, Mathematics, Vocabulary, and Spelling classes on both the high school and college levels. These programs are available for use with the Apple and PET/CBM computers.

Microphys Programs • 2048 Ford Street • Brooklyn, New York 11229 • (212) 646-0140

If a Computer Answers

Cont. from page 7

services, specific educational networks are cropping up (see page 8). EDUNET, a higher education network, is an excellent example of the possibilities multiservice networks provide.

EDUCOM, a nonprofit organization that promotes interuniversity cooperation in the application of computer technology, established EDUNET about a year and a half ago. EDUNET is only open to institutional members, and over 100 universities, colleges and nonprofit organizations have joined. EDUNET services include: electronic mail facilities and conferencing systems; tutorial programs in the humanities; simulation languages and games; extensive data bases; data base management systems, text editors and authoring languages; information storage and retrieval systems; and statistical packages. In effect, EDUNET allows group purchase of expensive software in addition to its communication and data base services.

Networking Costs

The cost of networking differs from service to service. Networks generally charge an initial subscription fee and a per-hour usage fee that is based on the cost of transmitting data. Initially, network costs were completely dependent on Ma Bell. This was all right for local networking, but long distance networking, like long distance telephoning, was extravagant. The development and FCC licensing of commercial data processing services such as Telenet and TYMNET have changed all that.

These services are technically called *packet-switched data carriers.* They maintain large, minicomputers (called *nodes* in networkese) in major population centers, and own the telephone lines that connect them. Users dial local numbers to connect to their nearest minicomputers. They type in their messages, which the computers break into small components, or *packets.* The computers act as traffic cops, automatically routing the packets through the web of telephone lines and computers that comprise the system, *switching* them from one line to another for the speediest delivery. While each packet might travel a different route, all arrive at the appropriate destination, where they are reassembled and transmitted. According to Telenet, this method enables the data processing services to handle a high volume of data economically.

Many networks use these data processing services rather than the telephone system. In a typical day, one of the services, TYMNET, uses over 500 minicomputer nodes to support over 2,500 simultaneous terminal users. Unlike long distance telephone charges, which are based on distance, Telenet and TYMNET charges are based primarily on volume of data transmitted. The result is a somewhat modest uniform charge that is passed on to the user through the data base information services—the Source, EDUNET, MicroNET, etc.

Assuring Local Access

The data processing services now reach about 90 percent of the population. What about the unserved 10 percent? I happen to be among them, a disadvantage of living in the north woods of Michigan. While the services are constantly expanding, and you may be on the next expansion list, the best approach to assure access is to promote a particular information service in your area.

With a list of interested users in hand, approach a network—MicroNET, for example—and say, "We have 50 potential users for your service, but we can't afford it unless we can get a local node." If the volume were high enough (someone told me 100 hours a month, but don't hold me to that), MicroNET would negotiate the extension of the data processing service to your area. And bingo—you're in business.

WATS numbers (toll-free 800 numbers) are also available for some TYMNET and Telenet information services. But these are still too expensive for individual schools. A recent FCC ruling permits joint ownership of WATS lines, a possible solution. Brokerage of a line between a school district and some small businesses might produce a workable rate.

* * *

Networking is to computer education what Columbia is to the space program: an advance that opens yet more possibilities in an already exciting new field. David Moursund, editor of *The Computing Teacher,* predicts that the future of microcomputers in education will combine stand-alone, independent systems with outside resources obtained through networking. The future can be now. Hook up. I'm looking forward to "chatting" with you some day soon.
T. G. Lee, SLS014 (Source), 70150,407 (MicroNET).

T. G. Lee, a media designer and consultant in Ontonagon, Michigan, is a regional contributor for Classroom Computer News.

For More Information

Networks and Data Bases

Bibliographic Retrieval Services (BRS)
702 Corporation Park
Scotia, NY 12302; 800/883-4707

Lockheed Information Systems
(DIALOG)
3460 Hillview Ave.
Palo Alto, CA 94304; 800/227-1960

New York Times INFORMATION BANK
Mt. Pleasant Office Park
1719-A Rt. 10
Parsippany, NJ 07054; 800/613-8056

System Development Corp. (ORBIT)
2500 Colorado Ave.
Santa Monica, CA 90406; 800/421-7229

CompuServe (MicroNET)
Personal Computing Division
5000 Arlington Centre Blvd.
Columbus, OH 43220; 800/848-8990

Telecomputing Corp. of America
The SOURCE
1616 Anderson Rd.
McLean, VA 22102; 800/336-3330

Time Share Corp. (Guidance Information System, Dolphin Computer)
P.O. Box 683
Hanover, NH 03755; 603/448-3838

PCNET, Personal Computer Company
P.O. Box E
Menlo Park, CA 94025

EIES
New Jersey Institute of Technology
Newark, NJ 07102

TYMNET
20665 Valley Green Dr.
Cupertino, CA 95014; 408/446-7000;
Customer Service: 800/336-0149

Telenet
General Telephone and Electronics
8330 Old Courthouse Rd.
Vienna, VA 22180; 800/572-0408

Articles and Periodicals

"The Source," by Ken Skier, *On Computing,* Summer, 1980.

"Computer Communications Systems," by Samuel A. Scharff, *On Computing,* Winter, 1980.

"Information Unlimited," by Donald L. Venable. Microperipheral Corp., 2643 151st Place N.E., Redmond, WA 98052 (request copy).

"The New Era of Electronic Mail," by Vincent R. Sombrotto, *The American AFL-CIO Federationist,* October, 1980.

Online: The Magazine of Online Information Systems. 11 Tannery Ln., Weston, CT 06883. Four issues for $52.00.

Information Retrieval & Library Automation. Lomond Publications, Inc., Mt. Aire, MD 21771. Twelve issues for $36.00.

Information on hardware and software prices is available from manufacturers.

Energy Savings with a Microcomputer

by Nyla Jane Witmore

Schools in Massachusetts are discovering that economizing on energy consumption can be a reality, not just a wish. By installing a standard microcomputer used for industrial control, they can balance existing heating, ventilating and air conditioning systems.

The Minuteman Vocational School in Lexington, Mass., saved $60,000 in oil bills the first year its computer system was in operation. In Acton, the junior high alone saved over 31,600 gallons in 1979-80, for a cash savings of $23,066. Acton's system, which cost around $20,000 paid for itself in less than a year, and the district is now adding five elementary schools to the computer-operated system.

The man responsible for developing these systems is John Martin, president of American Energy Management Systems, Watertown, Mass. Martin's energy saving systems need a dedicated computer capable of monitoring temperature and turning heating systems on and off. He uses a Texas Instruments 990 with 64K of memory, an industrial-grade computer durable enough for the continuous use it receives. Martin feels that other, similar-grade computers, such as those manufactured by Honeywell, Digital Equipment Corporation and IBM, could also do the job.

The system works quite simply. Martin's firm modifies its basic software package to meet the individual needs of each school, so that the computer keeps heat at comfortable levels only when the building is occupied. Sensors placed throughout the building feed information into the computer every hour, and the computer adjusts the temperature accordingly.

No Special Training

"We wanted a program that would allow existing maintenance, clerical or management personnel to operate the system," says Martin. "Many schools and businesses are afraid they have to have a resident genius to operate a computer. Not so. It takes an hour to teach someone how to run our system, and the computer responds to commands in English language—not codes."

Martin explains that the computer keeps hourly records of energy use and stores up to seven days' material at one time. In just a few minutes, the computer can print out the status of one day's work. The printout tells how many kilowatts were used and where in the building. It reports how many gallons of oil were burned each hour and indicates the outside temperature as well.

In a matter of minutes, the computer can print out a profile of energy use that helps spot waste and cut costs.

Operators can also monitor the system through remote terminals. In Acton, for example, the computer is in the building it controls, but on an especially cold weekend, the system operator can take a portable terminal home and connect it to the main computer over the telephone lines. He can then appraise potential trouble spots and make corrections without having to visit the plant.

Saving the Midnight Oil

When the Minuteman Vocational School began using the system nearly three years ago, it discovered that energy usage dropped at about two o'clock every afternoon. In the evening, when night classes and other programs were scheduled, the rate went up drastically, even exceeding the daily peak loads.

Studying the printout, school personnel discovered that the maintenance men were leaving the lights on in all the rooms throughout the building during their custodial rounds. By having the custodians complete all cleaning in one wing before moving to the next, the school was able to drop electricity usage to more economical rates.

In this way, the computer helps detect unnecessary waste. If a faulty switch results in lights being left on, for example, the computer can spot the problem and narrow the search for the correct switch. Cost savings are substantial.

The Minuteman Vocational School was able to trim costs even further by installing and wiring the sensors itself. Martin explains that a school can buy a package that includes hardware, software and applications engineering customized for the school, but retain responsibility for the installation. "This," he says, "could allow for a $5,000 to $10,000 savings, which in many cases would amount to nearly 25 percent of the job cost."

Here to Stay

Critics of computer-controlled energy management predicted it would become outdated. So far, that has not been the case. With inflation, rising costs and budget cuts, computers are becoming more, not less, practical for cutting energy costs. Remember that in Acton, energy savings paid for the computer in less than a year. Acton now saves $45,000 annually in heating costs, a figure likely to grow as oil prices escalate.

Some schools have sought federal grants to cover the cost of energy management systems. However, grant writers and consultants can cost a hefty amount, and time spent drawing up studies and proposals, and waiting for funding, is money lost. Many energy management firms guarantee installation in as little as six to eight weeks; some, including American Energy Management Systems, offer money-back guarantees, including promises to restore facilities to pre-computer condition if customers are dissatisfied.

Just as young couples ask, "Should we rent a house or should we buy?" many schools are asking, "Can we afford the bigger cash outlay now for larger savings later?"

Nyla Jane Witmore is a free-lance writer and photographer.

This article is based on a piece that originally appeared in the "Accent" section of the Minuteman Publications, Lexington, Mass.

Computer Use

Cont. from page 1

industry has, a Rolls Royce would cost $2.98 and would get 10,000 miles to the gallon.

The preceding allegory dramatizes, in familiar terms, the difficulties educational computing faces: lack of trained personnel, lack of planning and, most important of all, lack of the "fuel" to power the computer—high-octane software. As educators interested in computing, we need to better understand the problems we face and must overcome before computers will be able to take a place in educating our citizens.

Hardware

During the first 30 years of the computer "revolution," until 1978, technology was expanding rapidly, but hardware costs were still high. Comparatively few centers of development and learning could afford to develop hardware to train designers and engineers. With few centers and few computers, few trained "driving instructors" were available to train growing numbers of designers and engineers. In 1978, technological development took an unforeseen turn, which resulted in the personal, stand-alone computer and an unprecedented rate of manufacture through 1979. But we didn't have the trained "drivers" (users) to operate them, and we had almost no "fuel" (software) to make the hardware work for us. We had a vehicle that might take us fast and far, but without fuel it would just sit in its garage.

Alfred Bork, a professor of physics at the University of California-Irvine (UCI), reports that the current cost of computing at UCI is about $75 per student per quarter, but the hardware in use is over 15 years old. He estimates that cost would be only $25 per student per quarter with newer hardware, and he projects a cost in 1995 of only five dollars per student per quarter for hardware.

Bork's predictions make the future look quite rosy for the use of computers in education. But observers who have not wrestled with the task of fueling our computers cannot easily see the enormity of the problems we face. Time will be an important factor—time to plan, time to train, time to develop, time to manufacture and time to market.

Software

Suppose we wish to estimate conservatively the volume and the cost of software we would need, right now, to have a significant impact on our precollege educational system. Our precollege program covers 12 grades not including Kindergarten. In every curriculum area in each grade, we are most likely to use a textbook. The textbook will have at least 10 chapters. So 12 grades times 10 chapters equals 120 chapters for a given curriculum area, Grades 1-12. We can reasonably expect to need at least five 8K programs to support (or replace) each of those chapters, so 120 chapters times five programs per chapter equals 600 programs in one curriculum area alone.

But each grade has at least 10 curriculum areas (business, consumer economics, English, fine arts, foreign language, industrial arts, mathematics, physical education, science, social studies). We're talking about 6000 programs for a complete computer curriculum.

Next, we have to consider the different manufacturers' machines—Apple, Atari, PET, Radio Shack, Texas Instruments, to name but a few. Again, conservatively, estimating that we will supply programs for only four manufacturers' machines, we need 6000 programs four times over, or 24,000 programs.

> *While educational publishers are turning to electronic publishing, the process from bare beginnings to high volume output will probably take several years.*

Don Holznagel, current president of the national Association for Educational Data Systems (AEDS) and coordinator of MicroSIFT (Microcomputer Software and Information for Teachers clearinghouse of the Northwest Regional Educational Laboratory), surmises that programs cost about $8000 each to produce. He bases his estimate on the experience of the Huntington Project, a late-1960's effort to create educational software. The total cost of the Huntington Project—from hardware to salaries to rent to field tests—divided by the number of study units produced yielded an average cost of about $8000 per unit. Considering the reduced cost of hardware and the rising costs of labor and materials, Holznagel estimates that the same cost would be realistic today. So our 24,000 programs would cost us $192 million. We have a monumental task before us.

Training

Now suppose, by a stroke of good fortune, a generous philanthropist offered us $192 million to develop the needed high-octane software. How long might it take? Our allegory gives us some insight into the next problem: training. How many men and women are competently trained to design a high-octane program, and how many men and women are competently trained to code that program into a useful computer language?

Hiring one teacher and one technician won't do it. A large problem lies in the necessary cross-over of experience: an experienced educator can't design a good program without having some experience with computers, the psychology of learning, the psychology of motivation, computer graphics and game playing. Without this experience, the educator cannot communicate with the programmer. Ideally, our experienced educator would also have experience with computers and programming. Unfortunately, finding a surgeon who is also a trained violinist would be as easy—no doubt some exist, but few people are trained in both fields.

So even if we have $192 million, we don't have the trained personnel to design and create our 24,000 programs. Several educational centers now offer degree programs in computers in education. For example, the University of Oregon offers both Masters and Ph.D. degrees in Computers in Education, sponsored jointly by the School of Education and the Department of Computer and Information Science. However, since its inception in 1968, the program has graduated only about 20 Masters candidates and five Ph.D.'s. Most degree programs are newer than Oregon's, and the number of trained computer educators pales before the need.

Just consider how many trained people we would need to create our 24,000 programs in the next year. Holznagel estimates the labor cost for the MicroSIFT project at $5000 per program. If half of that goes for design by a trained computer educator, and if that educator earns $20 per hour, we need 120 person hours per study unit for the design alone. One such trained person might turn out 15 to 20 programs a year working a 40-hour week. If we divide 24,000 programs needed by, say, 18 programs per year per designer, we arrive at an immediate need for 1333 trained persons working full time. At present, to the best of my knowledge, no trained person is working *full time* at educational programming for microcomputers. If we rounded up all those educators who tinker in their spare time creating programs for their own classrooms, perhaps we'd find the needed 1333.

Based on MicroSIFT research, Holznagel breaks down software available today into three groups: Class 1, the high-octane material; Class 2, the material that contains good ideas but which needs extensive revision before becoming high-octane; and Class 3, the programs that "knock" badly—ones that are poorly designed, poorly implemented, contain bugs, have no clear objectives, etc. Holznagel says that little Class 1 software exists. Some Class 2 material is available, but most of the software educators write for their own classrooms is not designed for outside use and falls into Class 3. The software is certainly useful in the classes of the teachers who create it, but without the presence of the originating teacher, the material most often doesn't stand up.

Recently, large educational publishers have begun investing their venture capital in what is being called *electronic publishing*. They are bringing their experience of creating production teams—writers, artists, technicians and editors—to bear on the problem of creating good educational software. Scott, Foresman and Bell & Howell, to name two, are bringing together educators, programmers, technicians and editors to produce the high-octane software we're talking about. But the process from bare beginnings to high volume output will probably take several years. We're unlikely to see results from these nascent efforts before 1982.

Planning

Legislatures and universities are both notoriously conservative in their outlooks. "Within university administrations there needs to be some conscious effort to plan toward the future, not just toward the simple handling of day-to-day current crises. Very little such planning is currently visible," writes Bork.

When schools do look to the future today, they see declining enrollment and reduced funds under which they must operate today's school model. Administrators neither have the time nor see the need to examine other, possibly more creative, models. Bork makes a strong case for patterning use of computer technology after Britain's Open University, but his observations have so far fallen on deaf ears. If the usual political pattern applies, legislatures and universities will not plan for the future until the future overtakes them and they are forced to change or disappear.

Rate of Change

One problem in planning for the future is the rate of change in technology and knowledge. Some say knowledge doubles every ten years—educational institutions have an overwhelming task keeping up. As recently as May 1978, at the "Conference on Computing in Colleges and Universities: 1978 and Beyond," Professor John Hamblen of the Computer Science Department of the University of Missouri, was still pondering how we could bring the cost of a time-sharing utility down to $300 per month per terminal. Less than two years later, we have $500, stand-alone microcomputers that will do most of the jobs needed for K-8 educational computing and many of the jobs for Grades 9-12 computing. Microcomputers should soon be able to do many of the jobs needed in college-level computing. Few computer scientists foresaw the impact the microcomputer would make in only two years. With the future so uncertain, administrators cannot see how to plan even five years ahead.

Teachers

A recent study by the Northwest Regional Educational Laboratory concluded that approximately 66 percent of the school districts in the region are already using computers, and an additional 30 percent plan to begin use within the next three years. Yet few teachers who earned their certification before 1975 had any formal exposure to computers. Those who had, probably had no more than one course in FORTRAN. Schools of education still don't require knowledge of computing as a prerequisite for graduation, nor do state legislatures require computer literacy as a prerequisite for certification, but pre-service teachers today do have more opportunities to study computing on an elective basis. Because pre-service teachers carry a heavy requirement load, though, few have been able to grab this opportunity. Very few K-12 teachers yet have the knowledge necessary to use a computer in their classrooms. Through lack of knowledge, resistance to change or fear, then, teachers themselves are an obstacle to using computers in education.

Conclusion

Many agencies, industries and persons must cooperate to bring new technology to its fullest use. Two hundred years lapsed between the invention of the printing press and the common use of books in schools; 50 or 60 years passed before the automobile became a necessity. We are 30 years into the computer era. Our hardware is superlative, and we recognize its potential in education. But we have yet to gain the efforts and cooperation of teachers, legislatures, publishers, universities, authors and programmers.

What is holding back the use of computers in education? Almost everything . . . but not quite.

Dan Isaacson has a Ph.D. in computers in education from the University of Oregon. He is publisher and editor of CourseWare Magazine, *an educational computing consultant and a regular columnist for* The Computing Teacher.

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LETTERS

A Call for Vignettes

I am collecting vignettes of actual classroom computer experiences for a small book to inspire noncomputer users. We are hoping to get a wide range of applications, grade levels, types of schools and pedagogical purposes. Perhaps your readers could send us succinctly written (one page) accounts of their experiences for inclusion in our book. Send to: Peter Kelman, Assistant Professor, Department of Education, Dartmouth College, Hanover, NH 03755.

Peter Kelman
Hanover, New Hampshire

MicroSIFT Magic

Your MicroSIFT article ("MicroSIFT: National Network to Evaluate Software," Volume, 1, Number 3) was outstanding. It is obvious that you have done your homework. However, as an author and publisher of educational materials I found something lacking: what is the address of the network and to whom does one send materials and inquiries concerning possible analysis?

Roger W. Neal, President
Curriculum Applications
Arlington, Massachusetts

Send inquiries to: MicroSIFT, Northwest Regional Educational Laboratory, 710 2nd Ave., S.W., Portland, OR 97204.

A Good Start

I have just read Paul Shapiro's article, "Programming I: The Starting Gate" (Volume 1, Number 2). It is excellent. I have been teaching computer programming to junior high students for the past 12 years (using teletype) and now have micros. The article makes a fantastic kick-off point for the beginning of my course. I plan to use some of it in the next course I begin.

Mary S. Wallace
Corte Madera School

No Mickey Mouse

Our school has recently purchased three Apples. We have some software games, not bad, and some teachers and parents have been working on Math and English programs, but in searching for *good*, educationally sound commercial software, we've come up with a big zero.

I do hope you will review realistically the commercial software that is now coming on the market. Most of what I have seen, as of last summer, is too gimmicky. Elementary school children don't need the Walt Disney approach all the time.

Louise B. Landreth
Menlo Park, California

Remedial Software

The Livermore Valley School District is purchasing six Apple computers for use in remedial instruction, primarily in math. The students who will be using these machines are classified as disadvantaged or educationally handicapped. These senior high school students range from two to six years below grade level in math and reading.

Our difficulty in preparing to use these computers is in obtaining appropriate programs. Available software designed to augment remedial instruction is minimal—at least as far as we can determine. Suggestions of specific programs or the name of a software supplier knowledgeable in remedial education would be appreciated. Send to: Bill Lauritzen, Coordinator, Career/Vocational Education, Livermore Valley Unified School District, 685 Las Positas Blvd., Livermore, CA 94550.

Bill Lauritzen
Livermore, California

Library Resources

In the article "Source and Resource" in your Jan.-Feb. 1981 issue, Ms. Cipolla listed many publications that I believe could be of great value to our program. Would you please publish a listing of the addresses of these publications in your next issue?

Also, a correction to the article "A Small-Vendor Sampler," published in the same issue. Creative Computing Software, Edu-Ware, Micro Learningware, Program Design Inc. and Software Factory produce software for Commodore PETs in addition to the other systems mentioned.

Debby L. Kern
Fugett Middle School
West Chester, Pennsylvania

Thanks for your correction. Here are the addresses:

RIE: Resources in Education, *U.S. Superintendent of Documents, U.S. Government Publications Office, Washington, D.C. 20402.*
ISSN: 0098-0897 $42.70/yr.

CIJE: Current Index to Journals in Education, *Oryx Press, 3930 E. Camelback Rd., Suite 206, Phoenix, AZ 85018.*
ISSN: 0011-3565 $85/yr.

Computer and Control Abstracts, *IEEE, 445 Hoes Lane, Piscataway, NJ 08854.*
ISSN: 0036-8113 $195/yr.

Guide to Computing Literature, *Association for Computing Machinery, P.O. Box 64145, Baltimore, MD 21264.*
ISSN: 0149-1199 $50/yr. (pre-pay)

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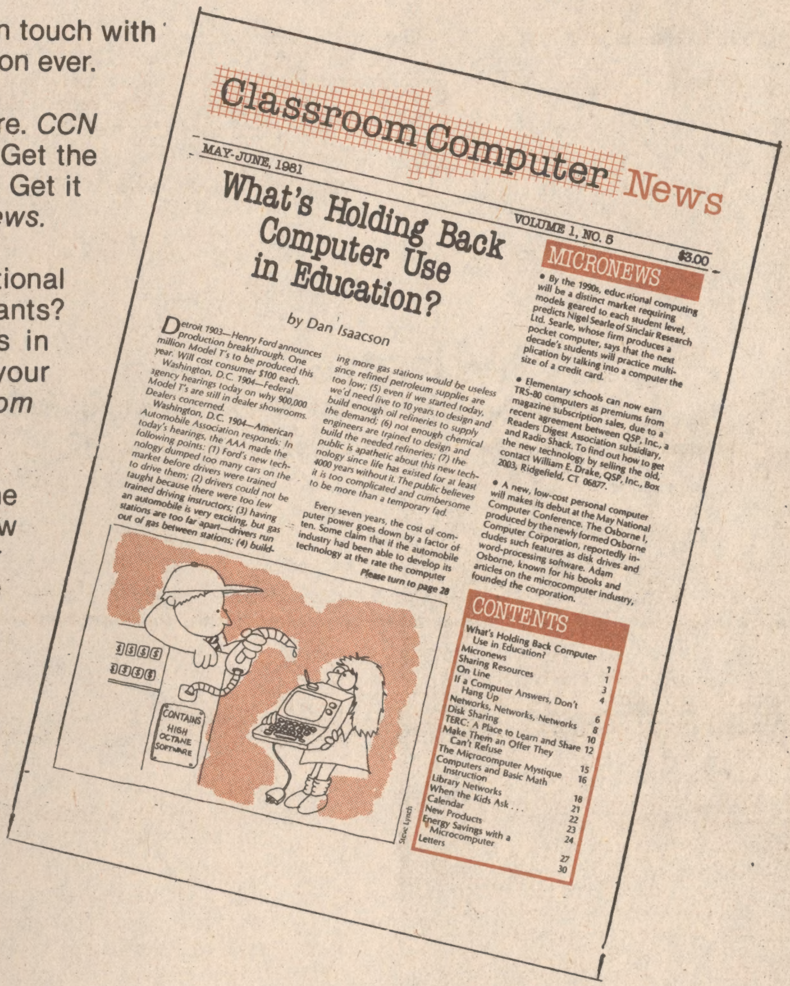

Classroom Computer News

MAY-JUNE, 1981

VOLUME 1, NO. 5

$3.00

What's Holding Back Computer Use in Education?

by Dan Isaacson

Detroit 1903—Henry Ford announces production breakthrough. One million Model T's to be produced this year. Will cost consumer $100 each.

Washington, D.C. 1904—Federal agency hearings today on why 900,000 Model T's are still in dealer showrooms. Dealers concerned.

Washington, D.C. 1904—American Automobile Association responds: In today's hearings, the AAA made the following points: (1) Ford's new technology dumped too many cars on the market before drivers were trained to drive them; (2) drivers could not be taught because there were too few trained driving instructors; (3) having an automobile is very exciting, but gas stations are too far apart—drivers run out of gas between stations; (4) building more gas stations would be useless since refined petroleum supplies are too low; (5) even if we started today, we'd need five to 10 years to design and build enough oil refineries to supply the demand; (6) not enough chemical engineers are trained to design and build the needed refineries; (7) the public is apathetic about this new technology since life has existed for at least 4000 years without it. The public believes it is too complicated and cumbersome to be more than a temporary fad.

Every seven years, the cost of computer power goes down by a factor of ten. Some claim that if the automobile industry had been able to develop its technology at the rate the computer

Please turn to page 28

MICRONEWS

- By the 1990s, educational computing will be a distinct market requiring models geared to each student level, predicts Nigel Searle of Sinclair Research Ltd. Searle, whose firm produces a pocket computer, says that the next decade's students will practice multiplication by talking into a computer the size of a credit card.
- Elementary schools can now earn TRS-80 computers as premiums from magazine subscription sales, due to a recent agreement between QSP, Inc., a Readers Digest Association subsidiary, and Radio Shack. To find out how to get the new technology by selling the old, contact William E. Drake, QSP, Inc., Box 2003, Ridgefield, CT 06877.
- A new, low-cost personal computer will makes its debut at the May National Computer Conference. The Osborne I, produced by the newly formed Osborne Computer Corporation, reportedly includes such features as disk drives and word-processing software. Adam Osborne, known for his books and articles on the microcomputer industry, founded the corporation.

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